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MR. W. H. MATTHEWS JONES,

City Engineer and Surveyor of Chester.

President of the Institution of Municipal Engineers, 1914-15.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

The Basis of Exchequer Grants for Road Maintenance.

In a letter to the *Times*, Colonel Ivor Philipps, M.P., expresses his apprehension that, unless some steps are at once taken by local authorities to concentrate public opinion on the subject, it seems probable that the road grants will be made in the form indicated in the Chancellor's Budget speech, "and without any particulars being given as to the mileage of roadway of each class, or the amount of the grant to be allotted to each county or county borough." Mr. Philipps then proceeds to explain his own view as to what is the proper basis for the distribution of the grants, and what is the procedure which should be followed. Taken as a whole, the letter suggests that the commonplaces of road administration have just loomed above the writer's horizon, with all the freshness of matters hitherto unconsidered. The procedure which he recommends is to a considerable extent inevitable and already in course of being put into effect, and the idea that the proportion between the mileage of first-class roads and that of second-class roads should vary according to the circumstances of each county is one which necessarily accompanied the first steps which were taken in the matter. Large areas will lie in gaps in the network of first-class or trunk roads, and other large areas, served by important secondary roads and main roads with much less traffic than those of the chief trunk roads, will necessarily receive the bulk of their grant on the 25 per cent basis. Again, the suggestion that the grants should be made in accordance with the rateable value, the area, or the population of each county is most illogical, since if any of these is of service as a basis for the distribution, it is clearly desirable that all of them should be taken into consideration, with qualifying factors in accordance with the relative importance of each. Mr. Philipps considers, however, that distribution in accordance with rateable value is, on the whole, the fairest system, and the only one which will meet with general approval—a quite untenable proposition, since one of the principal objects of the making of these grants is to provide for the maintenance of important trunk roads which pass through sparsely peopled areas of low rateable value.

As our readers know, our own view is that a large number of factors, including natural conditions, should be taken into account; and we have pointed out that the relations between area, population, rateable value, and road mileage should be considered in drawing up a scheme of factors influencing the allotments. Failing a really logical apportionment, made with the help of experts in local government administration, in highway engineering, and in natural and other local conditions, the best basis for the making of the grants is the exercise of pure judgment. By this means the various factors will, in a rough-and-ready manner, be taken into consideration; and this, it seems, is the best that the Road Board is likely to give us. The Road Board will receive from the local authorities their views as to which roads should be included in each class, and they will then get out their scheme, and prepare maps of the first class and second class roads. There is nothing, we believe, in the provisions that are to be made which will prevent the Board from including among the second class roads any road, however humble its class, with respect to which it may seem desirable to relieve the local ratepayers of a quarter of the cost of maintenance. Local authorities may therefore, if we are right in this, make their recommendations not only on a traffic basis, but also on any other basis which seems equitable, and we see no reason why there should not be specially liberal grants for second class roads in counties where large areas are on soft and silty ground, and where the costs of materials suitable for the making up of thick and well-drained crusts are high. The changes which, as we have just learned, are to be made in the Budget, and the probable necessity for legislation in order to give effect to the provisions relating to grants to local authorities, may result in considerable delay and some uncertainty in the matter. In the meantime the Road Board are collecting the materials for their maps, and may yet, we hope, decide to carry out the work on a logical basis and with the thoroughness which is demanded by the consideration that its effects will be lasting. Unsatisfactory as it is in some aspects, and unimportant as regards its definite, or more or less definite, recommendations, Colonel Ivor Philipps' letter is to be welcomed as tending to

creates the impression that the matter is worth the most careful attention and that the measures to be taken to ensure a just and useful classification cannot be taken with too much care and thoroughness. Road improvement funds can hardly be used to the extent necessary if the work is to be well done, and a liberal sum from the Exchequer for this purpose might be provided with great advantage in the end.

* * *

The Cheltenham Conferences.

Mr. H. T. Wakelam, M.INST.C.E., the county engineer of Middlesex, who presided so ably over the Roads Conference held last week in connection with the annual meeting of the Institution of Municipal and County Engineers at Cheltenham, went to the very centre of the modern road problem in the opening sentence of his inaugural address. If questions relating to ways and means could be excluded, highway engineers would have little difficulty in providing roads which would be void of offence to those who use them; and the possibility of lightening the financial burden attaching to road maintenance was therefore quite properly put in the forefront among the questions for discussion at the conference. Another important topic to which attention was called by Mr. Wakelam was the close connection which exists between town planning and the laying out of arterial roads. There is much to be said for the plan which he advocated that the routes of any proposed arterial roads should be first laid down, thoroughly discussed by sectional or central committees, and finally decided upon before town-planning schemes are sanctioned. By following this procedure the town plan could be designed with a view to the proper utilisation of main traffic routes, and isolation, which is both unnecessary and undesirable, could be avoided. Mr. Wakelam concluded his address with a graceful reference to the work of the Road Board and a tribute to Sir George Gibb, who was expected to take part in the conference. It was a pity that pressure of work prevented the chairman of the Road Board from being present, particularly as it was inevitable that his department should be referred to many times in the course of the proceedings. Altogether the conference afforded fresh evidence of the high position now taken by British road engineers. As Mr. Wakelam pointed out, whereas a few years ago British engineers were advised to go abroad to learn their business, times have so changed that engineers from foreign countries are now constantly visiting England seeking advice on questions relating to the important problem of road construction.

Those who were present at Cheltenham will agree that one of the most striking features of the whole meeting was the excellent collection of plans and models which were exhibited in connection with the Town Planning Conference. Mr. Pickering, in opening the conference, mooted the idea of a permanent collection under the official auspices of the Local Government Board. There can be no doubt that if such a collection were made it would have a double value. In the first place loan exhibitions might be held in various towns—a proceeding which would necessarily have a great educational value. Then again the collection would be of great practical use to those towns about to embark upon schemes of their own. It would be a fitting outcome of the highly successful Cheltenham meetings if a permanent memento could be provided by the establishment of such a collection either by the Local Government Board or by the institution itself. The practical interest of the board in the conference was evidenced by the presence of Mr. Thomas Adams, who delivered a most interesting address, which was much appreciated. Among the subjects to which he referred were the inclusion in schemes of lands already built upon, the desirability of communicating to the Local Government Board as early as possible notice of intention to prepare a scheme, and the great progress which has taken place in regard to town planning since the Act of 1909 was passed. A gratifying feature of the address was the recognition which it accorded to the municipal engineer as being naturally the person to prepare a town-planning scheme. While fully realising the necessity for co-operation between engineer, architect, owner, and any other interested party, this is the position that engineers have always taken up. Mr. Adams' address made an excellent introduction to a successful conference.

* * *

Sewage Disposal and Water Supply at Chicago.

It must be a source of gratification to engineers in this country to learn that two British engineers have been called upon to assist with their advice in dealing with the sewage of and securing a satisfactory water supply for such an important city as Chicago, and Mr. J. D. Watson, M.INST.C.E., of Birmingham, and Mr. A. J. Martin, M.INST.C.E., of Westminster, are to be congratulated on having been chosen to act in conjunction with Dr. G. A. Soper, of New York, as an expert committee to advise the Chicago Real Estate Board in such a difficult matter. Their preliminary report, extracts from which are printed on another page, has recently been issued, and contains several interesting features. It should be observed that the present system of sewage disposal is by dilution with water taken from Lake Michigan, the diluted sewage being discharged by way of a canal into the Desplaines River system, which ultimately empties into the Gulf of Mexico. The volume of diluting water which may be taken from the lake is limited by law, and as the volume of sewage has increased beyond all expectations, the conditions are now very unsatisfactory. The water in the Desplaines River was offensively polluted at a distance of 85 miles from Lake Michigan when inspected by the committee. Elsewhere odours were noticeable, grease lay upon the surface of the river, dead fish were numerous, and large quantities of sewage fungus were observable in the water. No wonder these conditions produced "a strong impression" on the board of experts, who recommend that the sewage must be treated in varying degrees according to the local conditions and requirements of different sections of the city, and that the water supply will need to be filtered.

To those who are not particularly concerned in the specific local problem those sections of the report which deal with the question of nuisances arising from sewage and trade wastes will be the most interesting. It is pointed out that the word "nuisance" does not admit of precise definition, and that what is a nuisance to some, or in some places, is not necessarily a nuisance to others in the same place or to anyone in some places. Further observations deal with cases where odours of a peculiarly offensive and pervading character from certain industrial establishments exist in close proximity to points of excessive sewage pollution. The opinion is expressed that the existence of one nuisance cannot condone another, nor is it reasonable, where many persons are affected, to aggravate an offensive condition of the atmosphere by the addition of another. Indeed, the whole question of what is a nuisance is dealt with in a very thorough and able manner, and these sections of the report are worthy of careful study by all who have to deal with sewage disposal works.

Private Street Works: The Charge on Premises.

An important and novel point of private street works law was decided in the recent case of *Croydon Rural District Council* v. *Betts* (noted at page 958, *ante*). It will be remembered that sec. 257 of the Public Health Act, 1875, contains provisions for enabling a local authority who have incurred expenses for works for which the owners of premises are liable to recover those expenses. Perhaps the most important of these provisions is that until their recovery, the expenses (with interest) are to be a charge upon "the premises in respect of which they were incurred." Now where each house or plot of land in a street belongs to a separate owner, of course, there can be no difficulty in applying this provision. But where a single individual is the owner of several houses or plots the section leaves it doubtful whether the expenses apportionable to the several premises can be lumped and charged generally on the whole, or whether the several premises are liable only each for its apportioned part. A moment's consideration will show that the question is not merely academic, but is of considerable practical importance from whatever point of view it is regarded. From the local authority's standpoint, where there are properties of unequal value (*e.g.*, houses and uncovered plots) it would obviously be more advantageous for the charge to be general. From the owner's point of view, and from that of his mortgagees, on the other hand, the general charge might operate unfairly. Mr. Justice Warrington decided that the charge is not a general one, but a separate one on the several and respective premises. He pointed out that the section does not give a charge on the interest of the owner, but on the property itself. Hence he thought it was only rational to hold that the Legislature intended that there should be a separate charge in respect of each separate plot, otherwise the charge could not be worked. It would be extremely unfair to the mortgagee of a small piece of land to have his security charged with a large sum in respect of other property of the mortgagor. The provisions for apportioning the expenses, in the learned judge's opinion, confirm this view, and show that the Legislature regarded the premises in respect of which the expenses are incurred as separate premises. However convenient it might sometimes be to a local authority to have a general charge, this decision appears to us to be consonant both with a reasonable interpretation of the section and with the equity of the case.

* * *

Superannuation.

A most important deputation from the National Association of Local Government Officers waited upon the President of the Local Government Board last week and placed before him the views of the association in regard to superannuation. Sir Homewood Crawford, the solicitor to the City Corporation, who holds the office of president of the association, acted as spokesman, and in a very able speech urged the several points in favour of the establishment of a national scheme which are so familiar to the great majority of municipal officers. He pointed out that, whereas municipal officers are called upon to discharge duties similar in character to, and certainly as important in their nature as, those duties which are discharged by civil servants, Poor-law officers, police, medical attendants of asylums, they have no right whatever to pension, although the officers he mentioned could claim one as a right when they unfortunately had to quit the service, either through the effluxion of time or through a breakdown in health. The confusion which exists owing to the fact that several local authorities have obtained schemes by means of private Acts of Parliament was emphasised, together with the consequent difficulty in which an officer is not infrequently placed if he desires to be transferred from one authority to another. The most satisfactory sentence in Mr. Herbert Samuel's reply was undoubtedly that in which he said "Therefore you have, in my view, a strong case—a very strong case—in support of your claim." He pointed out, however, that the question was surrounded with difficulties, and further that the Civil Service, as regards the higher branches of it, have a very severe competitive examination. The lower branches have a competitive examination which is not so severe, but a very high standard is required among the number competing to obtain the limited number of places. The question thus arises as to whether the grant of superannuation should not be accompanied by the establishment of a national standard for the officers of local authorities. In the result, the President promised to prepare a statement of the present position in regard to superannuation for local government officers, and to submit it to the representative association of local authorities, asking if they are prepared to approve of an inquiry being held into the whole question.

* * *

The Training of the Highway Engineer.

The first paper which came before the Roads Conference at Cheltenham last week was by Mr. H. Percy Boulnois, M.INST.C.E., who took for his subject "The Training of the Highway Engineer of the Future." The paper, which will be found in another column, dealt with a matter upon which Mr. Boulnois has already written in our columns. Briefly, his argument is that a new profession—namely, that of highway engineering—is coming into being; that those who intend to follow this new profession must receive a special training for their work; and that, having received such a training, they should be adequately remunerated for their services. The training advocated by Mr. Boulnois consists of a judicious mingling of theoretical work at a college or university with a sound practical course of pupilage to a practising engineer. The difficulty in such cases always is as to the proportions of the two ingredients of theory and practice, and as to which should precede the other. So far as the necessity for increased theoretical training is concerned, Mr. Boulnois' argument is amply justified by the increasing prominence which is being given to the technical and scientific aspects of road construction and maintenance. The same phenomenon further demonstrates his contention that the future lies with the specialist. Of course, technical instruction and laboratory experiments alone can never make a man into an efficient highway engineer. Practical training is an absolute necessity, and such a training cannot very well be obtained otherwise than by apprenticeship to a recognised master of the craft. Moreover, highway authorities must realise that engineers with special training of the kind indicated cannot be expected to give their services without a remuneration which is commensurate alike with the expense of their equipment and the special skill which they will have attained in the exercise of their profession. This important point was duly emphasised. In concluding his paper, Mr. Boulnois referred to the fact that the institution had decided to institute a special examination for candidates in road construction. This step should do much to encourage some of our technical colleges to provide a course of study which will fit students to obtain this special diploma.

Fast Traffic: Its Effect on the Roads, and the Remedy.

By "CONTRIBUTOR."

[illegible] The Physics and Dynamics of the Road Traffic Problem," the editorial remarks on the writer's first article* bring out very clearly the difficulties which he or any writer on a novel subject must encounter when they attempt to use terms accurately descriptive of qualities or properties of matter. The note suggests that in the first article the term "elastic" is employed to describe a quality of road crusts in a special sense, and that what is really meant is a greater range of resiliency.

It will, however, be seen that in the editorial the [illegible] "resilient" is also used in a special sense. The note then shows the difficulty which exists in stating accurately the mathematical relations between the speed and the dynamic effects. However, it will be sufficient for the purposes of these articles to admit the serious effect of present speeds on our existing highways, and to discuss the extent to which these effects may be reduced and economic efficiency obtained, by increasing the resiliency of the three parts of the road structure, the wearing crust, the strength crust, and the foundation.

When the writer contributed to your columns his first series of articles in the latter part of 1911, two and a-half years ago, he suggested that our road crusts should be studied in two parts—(*a*) a wearing crust, and (*b*) a lower portion, which he called a strength crust, and then drew attention to the (*a*) crusts from 1½ in. to 2 in. thick, which had already been laid by various contractors, and which at that time [illegible] satisfactory results. This system of laying roads in one or two courses, using bituminous or asphaltic materials, at any rate for the upper or (*a*) crust, has since the writing of these articles been largely developed, and has, on the whole, been so favourably reported on by road surveyors that there are now available very full data as to their comparative durability for a period of three years, and, what [illegible] up to a little [illegible] in total tonnage per yard width, corresponding to many years' wear of a country road, which shows that these [illegible] hitherto tried.

Naturally, the writer's attention has been kindly directed to those first mentioned by him. The lengths laid down by the Cormastik Company at Sideup were followed by other experimental lengths on other roads, and the same may be said of the work carried out by the Roadamant Company and by others who employed substantially the same methods.

So far as the writer has been able to learn, in the majority of cases where over thin coatings have maintained a good, smooth, non-wavy surface it has been due to a certain degree of resiliency in the coating itself, and that these successful surfaces have differed from other bituminous surfaces where greater waviness has been observed chiefly in this quality of resilience. It may be said that at the present time means have been found by which our existing highways can be [illegible] economically coated with a bituminous wearing crust, not exceeding 1½ in. thick at the sides and 2 in. at the crown, which endures the speed effects of modern traffic in a remarkably successful manner.

The writer has been fortunate in being able to test the resilient quality of portions of these thin crusts cut from roads where the traffic has been taken, and where upwards of 1,000,000 tons per yard of width has passed over the road since the crust was laid down, and has since analysed portions of these crusts and tested in various ways to ascertain, if possible, whether quantitative measurements can now be made in any way useful as a guide to engineers desiring to avail themselves of thin resilient qualities.

On examination these crusts showed that they closely resemble those originally described in the 1911 articles, as the material added to the mastic very largely consisted of stone chippings much larger than the coarse sand usually specified for American sheet asphalt surfaces. Herein these successful surfaces more nearly resemble the asphalt surfaces which have been frequently laid down on the Continent at Berlin and elsewhere under the name of Asphalte Coulé. They generally contain from 55 per cent to 60 per cent of coarse material, all of which passes the British standard ¼-in. sieve, and is retained on the British standard $\frac{1}{16}$-in. sieve with about 28 per cent to 30 per cent of material, all of which has passed the $\frac{1}{16}$-in. standard sieve, the binder, calculated as pure bitumen wholly soluble in carbon bi-sulphide, varying from 10 per cent to 12 per cent. Slabs of this material cut from the road, and other slabs made up in the laboratory to imitate them exactly in composition, moulded to exact dimensions, 9 in. by 6 in. by 2 in. thick, were exposed to a bending test when resting on supports, the inner edges of which were spaced 7 in. apart, and the best of these were found to carry weights up to 1,400 lb., applied for a period of sixty seconds at the central point between the supports; the observed deflection on the unsupported length was then observed to be 0·04 in. When the pressure was removed the slabs returned to their original position, no permanent deflection being observed. The tests were carried out at a standard temperature of 55 deg. Fahr.; at lower temperatures the slabs carried more weight with the same deflection, and, naturally, at higher temperatures a reduced weight.

These tests may be of service in showing that, by using suitable bitumen and an aggregate approximating as above, a road surfacing material can be constructed which has definite properties, and that material possessing these properties has been found in practice to be less liable to permanent deflection than the sheet asphalt mixtures of the American type made up with finer material, and which apparently do not possess these properties to the same extent.

The writer has tried many times to obtain the same results, using the coal-tar pitches as a binder; but even when the pitch is mixed far too hard for road purposes he has been [illegible] unsuccessful in producing slabs which would possess the smallest degree of resilience when submitted to the tests above described. In all cases the pitch-bound slabs yield gradually, even to light pressures, but the coefficient of restitution is nil.

It seems probable that in this quality of possessing a large coefficient of restitution within the limits of temperature that are usually met with at the surface of our highways in our climate will be found the true reason why the older asphalt pavements have been found to be so durable and withstand so well our weather, and wear and tear of traffic. At any rate, from recent reports that have been made to their councils by road surveyors who are studying this subject, we gather that they are now satisfied that good results can be obtained with a comparatively thin coating or carpeting of a resilient, bituminous-bound aggregate laid direct on to the new or partly worn surface of water-bound macadamised highways, and that no difficulty has been found in obtaining sufficient adherence between the upper surface of the road and the bituminous coating. It appears, however, that when the traffic is exceptionally heavy, so that it is necessary that the bituminous surface should have a greater thickness than 2 in., contractors have hitherto preferred, in most cases, to lay this bituminous coating in two thicknesses, "a" and "b," the lower coat "b" taking the place of the binder course suggested by Americans as necessary to be interposed between the wearing surface "a" and the rigid concrete support.

The writings of Clifford Richardson, Prevost Hubbard, Dow and Smith, and other American engineers expert in bituminous road construction, and the specifications that are now being regularly issued by American bureaux of highways, show that the use of this "b" or binder course is now fairly standardised American practice, and that the advantages of using this binder course are very marked. It not only serves as a resilient coat to cushion part of the shocks of the traffic which would otherwise be wholly borne by the "a" coat if the latter were laid direct on the rigid concrete foundation, but it is asserted that it is the best means of anchoring or attaching the "a" coat through the "b" coat to the upper surface of the concrete, and this is corroborated by certain contractors in this country who confirm that it is without doubt better to lay the "a" coat on a resilient "b" coat made up of somewhat coarser material than the "a" coat than to lay the "a" coat direct on to any

* THE SURVEYOR, June 19th, page 980.

rigid foundation. Although this double-coat work has been very successful, the writer believes that in practice it is found more difficult to lay it and to maintain it free from waviness than has been the case with the single thin coat laid direct on to water-bound macadam. It is not easy to point out the cause of this. It is possible that it is due to the well-known fact that hot material is not easy to roll free from waves in the first instance, and that this double-coat work has almost invariably been rolled, whereas the single-coat work has in many cases been trowelled and rubbed down to a level surface [illegible] and straightedges, so that the work, when first opened to traffic, has been freer from initial waves than is possible in the case where the work was consolidated by longitudinal rolling.

Tests show that there is considerable difference between the density of the material produced by the two methods at the time the surfaces are completed and thrown open to traffic. The density of the trowelled work then approaches very closely to the density it will hereafter attain under the consolidation of the traffic; whereas with the rolled work the most skilled contractors prefer to finish the rolling at a point where the density is considerably short of that eventually obtained by traffic consolidation. It is possible that it is during this tender period of final consolidation that the road work is most liable to deformation by traffic; the attention of road surveyors is directed to this question, which seems to be of importance.

We now come to the much-disputed question on the comparative advantages of laying the road crusts that have just been discussed on the two classes of foundation—on the one side the stone-block foundation or the cement-concrete foundation, both of which may be said to possess considerable rigidity, or, on the other hand, on a continuous foundation made of wetted ashes rolled in successive layers up to any desired thickness, which is, to some extent, itself resilient.

At Sidcup the Limmer Company and the Roadamant Company laid their material direct on to a concrete bed, as is usual in the asphalt pavements in the cities of England and America, but the Roadmart and Cormastik systems have since given excellent results with their material laid direct on macadam highways; but the year before last Mr. Lovegrove, the surveyor of Hornsey, decided to lay a most difficult section of Fortis Green-road direct on to a newly made foundation formed by rolling down successive layers of wetted destructor ashes until the desired thickness of 12 in. was obtained. This was carried out at a point where the road passed over a bed of clay, and which, when the road was in its original form of a macadam road, was found to break up, chiefly due to the clay working upwards through the macadam. Although the road was so narrow that the excavation of the clay, so that the required thickness of foundation might be laid, had to be carried on in half widths, it is found that the double-coat bituminous work—1 in. of "a" and 2½ in. of "b"—laid on this ash foundation has preserved its surface freer from waves and more perfectly, in every respect, than has been observed elsewhere in the same road, and certainly in better condition than where the same bituminous work rests on the original macadam or on the usual suburban road foundation of hardcore. In the latter case during the two seasons which have elapsed since this work was carried out, the usual slight subsidences have shown themselves followed by waviness on these parts of the road. No such subsidences and no perceptible waviness can be observed on the part laid over the rolled ash foundation. Here we have a case where, under identical conditions of traffic, that length of the road which in all three parts possesses resilient properties has distinctly shown its superiority over other parts where the foundation portion has been not so homogeneous and probably not so resilient.

There are many cases where destructor or furnace ash are available, and when foundation work of this class can be carried out at a far lower cost than would be possible with continuous concrete foundation. The writer believes that a good case has been made to show that such a system of road construction, if carefully studied and developed, may, and very probably will, yield almost ideal conditions of road construction, as it has undoubted advantages (1) as regards first cost and cost of annual maintenance, (2) accessibility for laying pipes, (3) affording good drainage, and (4) the property of minimising the vibration caused by traffic to the adjacent houses. In all these four respects a good case has been already made out for further trial, so that surveyors should pause before they commit themselves to heavy expenditure on rigidity and on the special and expensive forms of construction that rigidity entails.

N.A.L.G.O. AND SUPERANNUATION.

DEPUTATION TO MR. HERBERT SAMUEL.

A deputation representing the National Association of Local Government Officers waited upon Mr. Herbert Samuel, President of the Local Government Board, on Thursday of last week, in support of a scheme to form the basis of a Bill for providing superannuation allowances for all municipal officers and servants.

Mr. Homewood Crawford said it was desired to impress upon Mr. Samuel the grave injustice which was done to many thousands of municipal officers whose duties and responsibilities were constantly increasing.

Mr. Samuel, in replying, said the present position was one of much confusion. The deputation had a very strong case. Many important questions would, however, have to be solved. He proposed to draw up a statement and to communicate with all the great municipal organisations, asking them whether they would approve of an inquiry being held into the whole of this vast question, which involved immense sums of public money, as well as the contributions proposed by the deputation. He was not sure whether such an important matter should not be the subject of a Royal Commission, but upon that he would not say anything. In any case, he hoped the steps he was prepared to take would meet with their concurrence, and that the movement might be advanced a further stage towards its goal.

"HALF-WAGE" ROADMEN.

In the course of a recent meeting of the Wortley, West Riding, Rural District Council, Colonel H. S. Walker complained that his district, Wortley, was undermanned so far as the work of repairing the highway was concerned. He also urged, generally, that the highway surveyor (Mr. F. A. Crawshaw) should employ only able-bodied men.

The highway surveyor replied that he was under general instructions, in giving out employment, to keep as many poor people off the rates as possible.

The Chairman: Oh, no, I don't agree with you.

The Highway Surveyor: Well, I will not labour the point, but the relieving officer is constantly asking me to find a job for one poor fellow or another.

Colonel Walker said he did not want the highways to be a refuge for men who could not find work elsewhere.

Mr. Bingley: But we only pay them half a wage.

Colonel Walker: Pay them a proper wage, then.

It was resolved to call the attention of the Highways Committee to the matter.

Motor Traffic and the Upkeep of Main Roads.—In the course of the twelfth annual conference of the Lancashire Association of Urban Councils, held at Ulverston, Mr. W. H. Schofield, surveyor to the Lancashire County Council, gave an address on main roads, and dealt mainly with the financial side of the problem. The expenditure on the upkeep of the roads had gone up considerably in Lancashire. Although the Road Board had contributed £30,000 during the past three years, it was inadequate. The whole of the increased expenditure had undoubtedly been caused by the development of motor traffic, particularly motor wagons and motor chars-a-banc, which were now using the roads so freely and cutting them so badly. The heavy motor-vehicles emanated from the boroughs, the owners of the vehicles did not pay any rates at all towards the upkeep of the roads, and he did not think it would be inequitable to make the owners of these motor vehicles pay a substantial annual contribution towards the cost of the upkeep of the roads. Following a discussion a resolution was passed that the Main Roads and Bridges Committee of the county council should take into consideration the apparent injustice of the expenditure on through main roads being borne by the county council, and the non-contribution by the county boroughs.

Main Road Maintenance in Herefordshire.

By G. H. JACK, County Surveyor.

In June of last year the County Council of Herefordshire decided to abolish the district system of road management except in one district in their area, but the county surveyor, Mr. G. H. Jack, points out in his annual report that it would not be quite correct to say that the main roads are now under the direction of the county council—for these reasons: (1) The district surveyors are still engaged by the district councils, and are only responsible in part to the county council; (2) the roadmen are engaged jointly upon the main and district roads; (3) the [illegible] partly by the county and district councils; (4) the details of the accounts are in the hands of the clerks or surveyors to the rural districts.

"In short," he says, "the full responsibility for the management and financing now rests with the county council; and at the same time the actual execution of the work still rests to some extent with the district councils acting as agents for the county council."

From the point of view of the district councils this arrangement had the advantage of placing at their disposal a better staff and plant for the maintenance of the district roads. Mr. Jack ventures to give it as his opinion that from the county council point of view the system does not hold out a single advantage; on the contrary, it was against the interests of efficient main road management. "It seems to me," he observes, "that from whatever point of view the position is approached, there does not appear any reason why the finances of the county generally should suffer by reason of Herefordshire falling into line with the other English counties in the important matter of highway administration."

The county surveyor remarks that the old method of maintaining the roads through contracts with the district councils may be said to have been a success until the advent of motor cars; from that time its efficiency steadily declined until March, 1913, when it became impossible and unworkable mainly for these reasons:—

"First, the ever-increasing traffic made estimating exceedingly difficult, the roads giving way where least expected, and thus jeopardising the granting of the annual certificates. The withholding of these certificates was most irritating to the district councils, and, incidentally, a most unpleasant duty for me. Naturally, the district councils used every endeavour to guard against their financial arrangements being upset, and this brought about an inflation of the estimates and a constant demand for extra allowances. Thus in the case of there being the least doubt as to a road being passed, applications for increased grants were made with very little compunction, with the result that large sums of money had to be granted, otherwise the withholding of my certificate might be dubbed unreasonable.

"Secondly, the important question of accounts, which is now receiving the attention of the committee, is another factor in the difficulties attending the old contract system and the present agency system. It is of the utmost importance that the responsible official should have ready access to all accounts in connection with the work under his charge. In my opinion serious errors are likely to be made, and in fact have been made owing to the accounts being kept in no less than thirteen offices, three of which are outside the county boundaries. If the expenditure is to be kept anywhere near the estimate the accounts must be kept at the Shirehall for frequent reference.

"Thirdly, it is common knowledge that much better terms can be arranged with quarryowners, hauliers, and others where large orders are to be dealt with, and I have proved this to be so in connection with the Road Board work, which is under my absolute control and supervision. Competition is very much keener than it would be if this work were to be split up for execution by the district councils."

Mr. Jack mentions that adverse climatic conditions in Herefordshire are more severely felt than in some counties. The greater part of the roads consist of thin coatings of granite resting on red clay, which, when wet, will not support heavy or even medium loads.

EFFECT OF ENGINE TRAFFIC.

Engine traffic continues to increase in the county. Where the traffic is heavy and continuous the roads are quickly ruined. In other cases where the traffic is not excessive the county surveyor finds the effect is almost as ruinous, inasmuch as the convexity of the road is destroyed and the side ditches so squeezed as to be in many cases useless for the discharge of the surface water; this obstruction facilitates the soddening of the clay under the road haunches which is pushed into waves by the first locomotive. "The loss in metal alone on these weak sides must be very considerable," Mr. Jack remarks. During the last few years he has strongly advocated large sized material, either limestone or slag, for the sides instead of the costly Cleo Hill stone, but it appears that his recommendations have been somewhat tardily taken up by some of the district surveyors, and in other instances they have been ignored altogether.

WEIGHT OF TRACTION ENGINES.

"There cannot be the least doubt," Mr. Jack proceeds, "that the axleweights carried by the majority of engines using the roads of this county are far in excess of what is allowed by the law. It will be interesting and instructive to watch the results obtained by the laying down of Messrs. Avery & Avelings' axleweight ascertainers, by means of which the separate weight upon each wheel or upon each axle of vehicles may be obtained, also the total weight of the vehicle and contents. The machines will weight up to 16 tons.

RECONSTRUCTION OF TRUNK ROADS.

"The year just ended saw the commencement of the most important undertaking in connection with roads with which the county council has ever had to deal. The work comprises the reconstruction or partial reconstruction of about 22 miles of roads. The task of obtaining and hauling the necessary materials required is in itself a difficult and trying business. The several gangs of men and the steam rollers must be kept constantly at work if the best financial results are to be obtained. In many cases the quarryowners cannot turn out the material fast enough, which fact upsets the hauling arrangements and also the general progress of the work.

ALTERED CHARACTER OF ROAD REPAIRS.

"The whole character of the repairs on the much-used roads has altered during recent years. In this county there is now not nearly enough attention given to early repairs of potholes. The work must be done in the early stages, and must be skilfully and methodically executed. The life of the trunk roads is now less than one-half what it was when I came into office seven years ago. I notice in several districts attempts are made to force chippings into the holes with a heavy roller; this is not only ineffectual, but very expensive. If my recent instructions are properly carried out there will be no need for the use of a heavy roller; the old idea of waiting until the road is in such a state as to need recoating is very much out of date. The trunk roads must be frequently patrolled by competent lengthmen, and all necessary repairs, however slight, attended to at once. The time is not far distant, and in fact has arrived in some counties, when the principal highways will need as much attention as a railway track.

THE NEED FOR SKILLED WORKMEN.

"I am afraid that the pressing need for well trained and skilled roadmen is not recognised as it should be in counties like this where agriculture is the staple industry. The lack of skilled labour is everywhere apparent even in the richer counties. In Herefordshire the want of such men is becoming very serious. Modern methods are expensive, and unless the men understand their work there is every probability of much money being wasted. It must not be forgotten that the art of modern roadmaking is not more than fifteen years old at the most. To many people any sort of man will do for roadwork, the impression being that little or no skill is required.

"This is a great mistake. I venture to say there are not a dozen workmen in the county competent to act as foremen over gangs employed in the construction of waterproof roads. Most of the likely men for such work in this county are attracted by the higher wages paid in the industrial districts of Staffordshire and South Wales. It should be made known that

skilled labour upon the roads affords good prospects for a career, and that there is room in the country for quite a number of such men. A wage must be offered which will attract men who are sufficiently alert to quickly grasp the elementary scientific principles of good road making. The extra wages paid would be recouped over and over again, if only for the reason that the work would be thorough in the first instance. It matters little how competent the chief surveyor or his staff may be, if the men who actually do the work are untrained, and consequently incompetent, the result must be unsatisfactory and costly into the bargain. It is quite impossible to get good work out of a bad workman, however much he is supervised. Intellect and labour taken separately are insufficient; what is wanted is a combination of the two, or as the motto of the Royal Agricultural Society has it, 'Practice with Science.'"

INTERNATIONAL FIRE SERVICE COUNCIL'S MEETING IN LONDON.

The International Fire Service Council's Executive, who comprise the delegates of the European committees and associations concerned in the subject of fire protection—which bodies together have a membership exceeding three million—have been holding a series of meetings in London at the invitation of the British Fire Prevention Committee. The meetings have been honoured by His Majesty wishing the council success; the delegates have been received on behalf of His Majesty's Government, who have entertained them at luncheon, when Earl Beauchamp presiding took the opportunity to express his appreciation of their work and its beneficial influence, and the London County Council has entertained the visitors, and afforded them numerous facilities. The whole of the arrangements for their reception were in the hands of the British Fire Prevention Committee, whose detailed programme for their stay was much appreciated, as was also the hospitality the committee was able to accord them, and it was generally felt by the foreign visitors that the manner in which they had been received in this country, both officially and privately, was quite exceptional, and the interest accorded to their work, and to that of their British hosts, most flattering, and augured well for the advancement of fire protection.

The work of the International Council, which was presided over by Commandant Meier, of Amsterdam (president of the council), included the technical arrangement of the proposed International Fire English-French-German Dictionary of 5,000 technical terms which the council will now be able to issue shortly, thanks to the liberality of an English donor who has offered to bear the cost of its production.

Arrangements were made for the holding of a full meeting of the council, and an International Fire Congress at Copenhagen in 1915, when questions relating to celluloid dangers, fire on board ship, petroleum dangers, and the formation of county or district motor fire brigades are to be under consideration. A considerable amount of administrative work also had to be attended to.

The visitors were shown the British Fire Prevention Committee's testing station at Regent's Park; the London Fire Brigade headquarters, where a special display was arranged for them, and a number of large buildings and factories in the Metropolis in which modern fire preventive measures have been adopted.

A special point was also made of affording the visitors facilities to meet the principal Government and municipal officials concerned with a view of interchange of experience. At the Government luncheon the principal permanent officials of all departments primarily concerned were present, including the leading officers from H.M. Office of Works, the Home Office, Local Government Board, Board of Trade, Board of Education, and General Post Office. The London municipal authorities were represented by Mr. Percy Simmons (Chairman London County Council Fire Brigade Committee), Mr. W. E. Riley, F.R.I.B.A., M.INST.C.E. (the superintendent architect), Mr. J. Ollis (the chief officer Public Control Department) and Mr. J. W. Restler, M.INST.C.E. (chief deputy engineer of the Metropolitan Water Board).

As to speeches, Earl Beauchamp's remarks on fire prevention in proposing the toast of "The International Fire Service Council," have special bearing on the work done in Great Britain, and claim the closest attention as being addressed to such an audience. He observed that the British Fire Prevention Committee had taken an active part in the work of the International Council, and they had also founded an important fire testing station, which had been taken as a model in other European countries and in the United States. Their tests were generally recognised, their influence had gone far towards affecting all questions of building and construction in England to-day, and it was a matter of special interest to note that for the very first time, in the course of last year, the actual loss of property in London, or the value of the property which was lost in London by fire, was less than the cost of maintaining the London Fire Brigade. So they had learned a great deal from the British Committee with regard to the use of materials and the knowledge of fire control.

The President (Commandant Meier) said the name of the British Fire Prevention Committee was known not only in England, but far over all frontiers on the Continent. They all knew the "Red Books" of the British Fire Prevention Committee, and they knew them to be of the greatest value to the fire service all the world round. And when he named Mr. Edwin O. Sachs, the founder of that committee. Hear, hear! whose energy and science and knowledge had directed its works during the past fifteen years, he was sure he spoke in the name of the whole International Fire Service Council when he addressed to him his most sincere compliments. To obtain what they of the council would wish to obtain, and to make the progress in their work which they aspire to do, it was necessary not only that they should interest themselves deeply in the great problem of their science, but it was of the highest interest that Governments and municipalities should give them their assistance and support.

Altogether the conference, besides doing useful technical work, was a remarkable achievement towards the general advancement of the all-important subject of fire protection at home, where the advent of a new era of scientific fire protective work may be said to have now arrived, and to enjoy official recognition.

Tar-painting of Roads.—Mr. S. Sutcliffe, surveyor to the Mytholmroyd Urban District Council, and patentee of a very successful road, footpath, and channel snow plough, has invented and patented a novel device for tar-painting roads by hand. It consists of a pail which distributes the tar in an even film over the road, and it is claimed for it that it always gives the same results, nothing being left to the discretion of the man using it. The tar is simply turned on, and the pail does the rest. The apparatus can also be fed by means of a flexible pipe direct from a tar-boiler.

The Withdrawal of Grants to Local Authorities.—In the House of Commons last week the Prime Minister was asked whether, in view of the decision of the Government to withdraw the promise of grants to local authorities, he would arrange that any costs to which local authorities might have been put in obtaining information in respect of the classification of roads should be refunded from the Imperial Exchequer. Mr. Herbert Samuel (President of the Local Government Board) replied that no such decision had been arrived at by the Government, and the point therefore did not rise. He understood the expenses were extremely small.

Housing and Town Planning: Compulsory Acquisition of Land. In the House of Commons last week the President of the Local Government Board was asked whether any local authorities in England and Wales, and, if any, which, had acquired land by the application of the compulsory powers contained in the Housing and Town-Planning Act, 1909; and whether he would state what prices were asked and what awards made in each case. Mr. Herbert Samuel said the only local authorities by whom land had been acquired under the compulsory powers in question were the Erpingham Rural District Council and the Corporation of Weymouth. In the former case the award was for £382 for about twelve and a quarter acres of land, but he had no information to show that the land was offered to the council at a price. In the Weymouth case the land was offered at £1,000. The award was for £831.

Institution of Municipal and County Engineers.

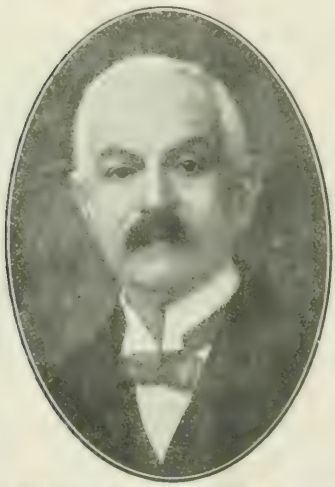
ANNUAL MEETING AND HOUSING AND TOWN PLANNING AND ROADS CONFERENCES AT CHELTENHAM—(2).

[illegible] Highway Engineer of the Future" [illegible] Paper [illegible] by Mr. H. P. Watkins [illegible] Mr. [illegible] Bailey the paper was taken by Mr. Watkins [illegible] that Sir George Gibb [illegible] been prevented from sending in his promised paper on "The Law of Railway Promotion" in Road Maintenance. He [illegible] was unable to be with them at the meeting.

THE TRAINING OF THE HIGHWAY ENGINEER OF THE FUTURE.

By H. Percy Boulnois, M.Inst.C.E.,

Past President.



You may [illegible] if you have read a letter on the above subject written by me and published in The Surveyor in December of last year, in which I pointed out that the change in the traffic of our roads may eventually result in developments which we can at present hardly realise; that the road of the future may be called upon to carry greater and greater weights at ever increasing speeds, and that more scientific methods will probably have to be adopted in the future for the construction and maintenance of our roads. I pointed out that formerly the only persons who criticised our roads were the road users, the ratepayers, and the "amateur experts," but that now their ranks have been strengthened by many chemists and technical experts who are taking a keen interest in the road problem, as they evidently see that there is a future for those who will examine the problem from the technical and scientific view as well as from the practical side.

I suggested that a new profession, that of the "Highway Engineer," was on the eve of formation, and that the question of the manner in which a member of this new profession was to be trained was worthy of consideration. At the same time I pointed out that technical calculations and laboratory experiments would not make good roads, as there are so many practical considerations which might tend to upset mere technical knowledge, but that if a highway engineer could combine this knowledge with his practical work he would no doubt be better able to cope with some of the problems of road construction, and that it seemed to be of the highest importance that this question of training should be carefully considered with regard to the younger men who will act as assistants and highway engineers in the future.

There can be no doubt that the introduction of self-propelled traffic by means of the internal combustion engine has entirely changed the problem as to the weights and speeds of the traffic which the road of the future may be called upon to bear. With horse-drawn traffic these weights and speeds were limited within narrow rigid limits, but with modern traffic these limits are removed, and no one can tell as to what weights and at what speed the traffic of the future may develop. It is true that legislation may from time to time impose restrictions on the traffic, as it has frequently done in the past, but the clamour of commercial needs and the popular outcry for increased means of transport will very soon break down any such artificial barriers to progress, and the highway engineer of the future will have to provide for these inevitable changes which are certain to take place.

The past evolution of our railways is one instance of the change that arose immediately mechanical methods of transport were introduced. The lightly constructed railway of the past has had to give way to a strongly built permanent way that will carry the enormously increased weights of the locomotives and carriages which are now imposed upon it, and the permanent way engineer has had from time to time to strengthen and improve his roadway in order to meet the ever-increasing demands made on him by the locomotive and rolling stock departments. It is by no means inconceivable that the highway engineer of the future will shortly be called upon to make similar improvements in his roads, and he will suffer from the great disadvantage of not having that control over the user of his roads which the railway engineer enjoys.

But, apart from this, we are already face to face with the fact that road construction is inevitably altering in its character. Where formerly there was but one form of construction for the ordinary road—viz., that which was known as "water-bound macadam"—there are now already a large number of different methods of construction, for all of which special advantages are claimed. It is evident that the "road question" has entered a scientific field never before contemplated, and that something more will be required of the highway engineer of the future than the mere rule-of-thumb experience of the past. The question consequently arises as to whether there is a necessity for specialising in this direction, or whether the ordinary training of a civil engineer is sufficient for the purpose. It may be argued that in the early days of civil engineering there was no special training available, and that the great engineers of the past demonstrated by their work that such training was unnecessary, and that many men of the present day have risen to the occasion and have approached the question of modern road construction on scientific and technical grounds, combined with their practical experience. This may be perfectly true, but if special training was unnecessary in the past, why was it that scientific training has gradually reached such large proportions at the present day, and that there should be the considerable number of colleges and universities which now exist, where very special scientific and technical knowledge is imparted? The law of supply and demand holds good in everything. If there had not been a demand for this special training of the engineer it would never have been so provided, and the engineering profession of to-day would be restricted to a few men of exceptional genius who perhaps require no such special training. The question is, therefore, Is there a demand for the special profession of the highway engineer, and, if so, in what manner should he be trained?

I venture to think that I have shown that there is already a demand for the special profession of highway engineering, but the manner in which the highway engineer of the future should be trained is not so easily answered. . . .

The United States of America has endeavoured to meet this question by giving a special course of training in highway engineering at the Columbia University in the city of New York, which might form the basis on which some such special training could be instituted in the technical universities and colleges of our own country. . . . There is a well-equipped testing laboratory for bituminous materials, and other testing laboratories in connection with the university, so

that the students can obtain a very thorough theoretical and practical training in highway engineering.

It would be a great advantage if the young highway engineer could also have some knowledge of either German or French. It is rather lamentable to reflect that quite recently a road engineer adjudicated in the Law Courts that he thought a "metre" was only a foot in length. One would have thought that some knowledge of the metric system was an essential attribute of the engineer.

It may, of course, be argued that too much theoretical and laboratory experiment will not make road, but I do not think it can be denied that the young man who is equipped with a thorough scientific and theoretical knowledge of his subject should be better able to cope with the present-day traffic problems than one who is not so equipped . . . I admit, however, that the technical training must be followed by practical experience, and there appears to be no better way of acquiring this experience than that of an articled pupilage under an engineer or surveyor who is responsible for the roads in his district. Intuition, common sense, originality, a knowledge of men and how to handle them, the value of materials, and many other subjects cannot be taught in the "school," and can only be acquired when the "rough and tumble" of the professional life is commenced, and it would be during his pupilage that the young highway engineer would acquire these necessary additions to his store of knowledge.

It may be justly argued that such a training as I have endeavoured to sketch out will require a considerable expenditure of time and money, and that the present emoluments meted out to the highway engineer are not commensurate with this expenditure. To this I can but agree: a training such as I have suggested should command better pay than that which is often grudgingly given to the man who is responsible for the construction and upkeep of roads which are every year involving larger and larger expenditure of money and skill in their maintenance. If the road of the future will demand more science for its well-being, it is only right that science should demand better pay for its work. The specialist should always be able to secure better remuneration than the ordinary practitioner, and this should hold good for the highway engineer of the future. . . .

I have endeavoured to show in this short paper that (1) A new profession, viz., that of the highway engineer, is on the eve of commencing; (2) he should receive a special training for the purpose of this new profession; and (3) that his services require adequate remuneration. If I have failed I can only quote from the lines of an anonymous philosophical poet, who wrote . . . in 1843:—

> "For every ill beneath the sun
> There is some remedy or none.
> If there be one, resolve to find it;
> If not, submit, and never mind it."

Mr. Boulnois added that he was glad to hear that the institution was thinking of holding separate examinations for candidates in road construction. Those men who presented themselves for this examination must have learned their work somewhere. He was hoping that many of our colleges and educational institutions would start classes on road construction. He found at Manchester that the University of Manchester had already been doing that, and for the past nine years they had had courses of theoretical and practical instruction on geology as applied to road construction.

DISCUSSION OF MR. BOULNOIS' PAPER.

Mr. E. J. Stead said it seemed to him that there would have to be a very great change before the course advocated by Mr. Boulnois could be followed. It meant a change in the whole system of pupilage or articled apprenticeship that was now in force, and there would have to be a very considerable increase in the salaries paid in future. If young men entering the profession had to look upon the money spent upon their education as an investment, then he thought the salaries would have to be very largely increased. He was quite in accord with the principles which Mr. Boulnois had laid down for the practical as well as the scientific training of the highway engineer of the future, and he thought it would be most useful if some arrangement could be made by which the two could be combined.

Mr. H. F. Gullan (Belfast) said the point which struck him with regard to the technical training allied with the practical work was the difficulty which Mr. Stead had already mentioned with regard to the articled pupil. That difficulty might be met by shortening the period of the pupilage, and having the scientific theoretical instruction either prior to or subsequent to the pupilage period. The training of the road engineer would mean the adding of some scientific branches to the curriculum of the engineering colleges. Whatever might be done in that direction, the practical work must form the more important part of the training of the road engineer. Practical work could never be taught at college; a man could never be taught there how to set out a road to the correct levels, and the many incidental matters which arose every day with regard to practical road making, and the man who had not that practical experience, even if he had taken the highest passes in an examination, would find himself very much at sea when he came to do actual work. The result of this would be a practical training for a shorter period as an articled apprentice, and the remaining period of the training would be devoted at college to the technical part of the work.

Mr. Boulnois, in reply, said he quite agreed with both speakers that there were practical difficulties in the way. He would like to point out with regard to the cost of training that he had put this paragraph in his paper: "It may be justly argued that such a training as I have endeavoured to sketch out will require a considerable expenditure of time and money, and that the present emoluments meted out to the highway engineer are not commensurate with this expenditure. To this I can but agree; a training such as I have suggested should command better pay than that which is often grudgingly given to the man who is responsible for the construction and upkeep of roads which are every year involving larger and larger expenditure of money and skill in their maintenance. If the road of the future will demand more science for its well-being it is only right that science should demand better pay for the work." He particularly wanted to draw attention to that because he did not think the public were realising that the road engineer of the future must be a skilled man. He had pointed out in his paper what was the result of the introduction of steam on the railways. Just compare the railway of fifty years ago with what it was to-day. Every year the railway was called upon to bear heavier weights; so it would be with the roads. Every year the road engineer would be called upon to construct roads to bear heavier traffic. Mr. Stead had drawn attention to an aspect of this technical training for the road engineer which would cause a little difficulty. It would shorten the period of pupilage. But what he had pointed out was this: that the boy who had a technical training for his work would make greater advance than the boy who went straight into a road engineer's office without this preliminary scientific training.

At the resumed sitting of the conference on the following day (Thursday) the subjoined paper was presented:—

THE PREVENTION OF THE SUBCRUST MOVEMENT IN ROADS.

By E. S. Sinnott, M.Inst.C.E.,
County Surveyor, Gloucestershire.

[Mr. Sinnott was educated at Clifton College, and at University College, Bristol (now Bristol University). From 1886-89 he was a pupil of the late Mr. John Ward Girdlestone, M.Inst.C.E., chief engineer, Bristol Docks. From 1889-93 he was engaged on railway and dock work for the late P. Walter Meik, M.Inst.C.E., in London and Edinburgh, and in 1893 he designed the Bristol Industrial and Fine Art Exhibition. He was engaged from 1894-99 as resident engineer on the Port Talbot Railways and Docks, Glamorganshire, and from 1899-1907 was in private practice in Cardiff, principally in connection with railways, tramways, and road widening works for the Glamorgan County Council. He was appointed county surveyor of Gloucester in 1907.]

From time to time the writer has had under his observation the behaviour of roads subjected to heavy traffic, and he has recently initiated certain experiments to determine, as far as possible, the lateral and longitudinal movement of material forming the subcrust of highways. As a preliminary to more precise investigations, he has arranged, during the past few months, for various sections of grass verge adjoining the principal roads in Gloucestershire to be opened, and some of the results of such openings are shown in Figs. 1, 2, 3 and 4.

Speaking generally, these indicate that lateral movement, in some instances to a considerable extent, has been taking place, and such movement seems to call for special consideration.

The following examples will serve as illustrations:—

(1) On main road (Gloucester to Bristol) at Whitfield,

near Fathead. At this point the grass verges were opened on both sides of the road, and on the west side there was found, at a depth of about 4 in., a bed of broken limestone having a width of 3 ft. from the metalled surface, varying in thickness from 7 in. nearest the road to 4 in. at the 3-ft. distance. On the east side a somewhat similar state of affairs was found to exist, the width in this case being 2 ft. 6 in. from the verge. The subsoil is a hard, red clay.

(2) On main road (Bristol to Malmesbury) near Chipping Sodbury.—In this instance the lateral thrust is shown in the movement of a line of channelling formed of three stones on edge put in to protect the foot of a bank; originally laid with a horizontal face of 13 in. in width, the stones have been forced into a vertical position, having moved through an angle of 90 deg. In several instances the upper stones have been forced completely over, having rotated through an angle of 180 deg., and have fallen backwards into the highway, their movement away from the road being arrested by the bank they were put in to protect. The subsoil is clay.

(3) On the main road (Gloucester to Bath), between Hardwicke and Stonehouse.—In this case metalling and pitching have been found from 3 ft. to 5 ft. from the metalled surface, and about 18 in. in thickness. The subsoil consists of clay and sand.

(4) On the main road (Cirencester to Cheltenham) at Baunton Hill.—The opening at this place showed that the original pitching and oolite macadam had been forced for a distance of 4 ft. from the edge of the metalled surface, the outer end showing an upward movement. The subsoil is clay.

The results above described indicate generally the position of affairs upon roads where traffic is heavy, although in a small minority of cases investigated little or no movement could be detected. It appears evident, however, that where lateral spread does occur it cannot fail to be ultimately destructive, as without substantial and immovable support the top coating cannot be kept up to its work, particularly after some wear has taken place, and it becomes a question how far new surfaces of an expensive character are justified before the subcrust movement referred to has been arrested.

With a view to obtaining more accurate information, the writer has lately placed a number of iron bolts below the surface of certain roads, and has fixed their position exactly by steel-tape measurement; so that any movement can be definitely ascertained on a future occasion. He has also inserted measuring instruments, as illustrated in Fig. 5, at various places, which consist of two rods arranged to slide one over the other, having iron plates at their outward extremities, which will enable any movement, either lateral or longitudinal, to be recorded.

As a means of preventing the action above described, the writer has recently designed and put into use a rigid framing, the essential feature of which is that longitudinal and cross members placed at a suitable depth below the surface preclude any movement of the subcrust, and at the same time provide a means of constructing an impervious arch of tarred macadam to carry the traffic, great additional strength being provided by the longitudinal members for the support of the heaviest road vehicles. For various reasons the writer thought it best to construct the frames in ferro-concrete, although timber or other material could, if preferred, be used. The form adopted after one or two experimental frames had been made was that shown in Fig. 6. The longitudinals are 12 in. by 3½ in. (average thickness) by 12 ft. long, and are slightly tapered from top to bottom. The ends of the longitudinals are securely housed at the extremities of the cross ties. The reinforcement consists of expanded metal, 3-in. mesh, ¼ in. by $\frac{5}{16}$ in., weighing 11½ lb. per super. yard, cut into strips 9 in. wide—in the case of the cross-ties this is supplemented in a minor degree with wrought-iron round bars of small section at the ends of the same. A further modification consists of making the longitudinals slightly curved on the inside in order to withstand lateral thrust more effec-

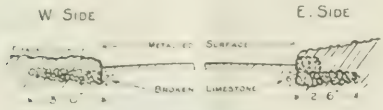


Fig. 1.

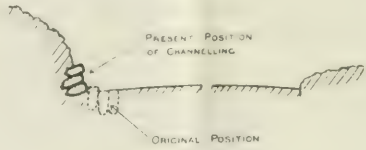


Fig. 2.

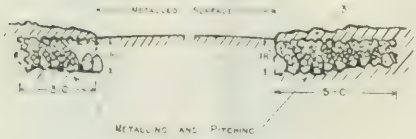


Fig. 3.

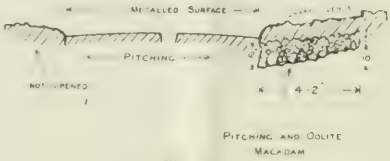


Fig. 4.

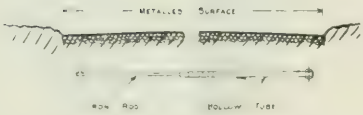


Fig. 5.

Fig. 6.

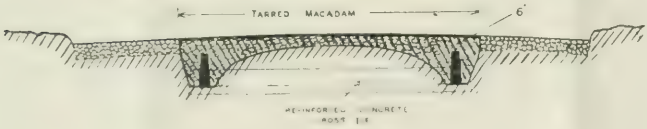


Fig. 7.

SUBCRUST MOVEMENT IN ROADS.

tyre), also, where traffic duties due to traffic may be anticipated, in placing the cross-ties in position they can be made in two parts and connected in the centre with a bolt or bolts.

In the experimental frames which have been put down the width between the longitudinals has been fixed at 8 ft.; but there is no particular reason for adopting this dimension other than that it appears suitable for dealing with the traffic conditions of rural roads in Gloucestershire, where most of the heavy weights are carried in the central portion of the highways. If considered advisable, a greater width than 8 ft. may be adopted between longitudinals, or, where traffic conditions justify it, the central pair can be supplemented by longitudinals on either side, connected thereto by cross-ties similar to those previously described. The frames have been placed as shown in Fig. 7, the top edges of the longitudinals being 6 in. below the finished road surface, which, from the information at present at the writer's disposal, appears the most suitable position for arresting the lateral movement; also, at this depth there would be little or no interference with pipes, and with 6-in. cover over the top side of the longitudinals, there appears to be sufficient cushion to avoid any damage thereto.

Note.—The method of preventing subcrust movement described in this paper has been provisionally protected.

DISCUSSION OF MR. SINNOTT'S PAPER.

Mr. J. S. Brodie (Blackpool) said he took it that the whole idea of this invention was in some way to strengthen a very weak foundation. [Mr. Sinnott: That is so.] He did not know whether Mr. Sinnott had made any experiment in a regular hand-picked foundation or not. He should not think there would be much trouble in a hand-picked foundation under the road crust. His experience was that where they had not a hand-picked foundation, but a broken-stone foundation, there was considerable trouble, both laterally and longitudinally, and that was the cause of the corrugations in the surface where the foundation was not very strong. The great difficulty in keeping the surface in order with a water-bound crust was the corrugations. If they examined that to the foundations they would find that it was caused by the very weak foundations under the roads. He must say that the proposals which Mr. Sinnott had made there, and which he appeared to have patented, were very good substitutes for a regular, firm foundation. The great difficulty in rural roads was the enormous cost of putting in adequate foundations to carry the traffic, and if Mr. Sinnott had solved this economically by putting in something to take the place of a hand-picked foundation he would have earned the thanks of every road engineer in the country. He had very great pleasure in moving a vote of thanks to Mr. Sinnott for his paper.

Mr. H. Percy Boulnois (Westminster) seconded the vote of thanks. He had read the paper with considerable interest, and he could confirm what Mr. Sinnott had said as to the lateral movement of roads. It would be found that in country roads, unless the haunches were well supported, there was a tendency to spread. That constantly occurred, and on almost every country road they found that, unless there was some strengthening for the crust. Looking at the diagrams, he wondered whether the foundations which were pushed out were the foundations of old roads which had been covered, and of which they had lost knowledge, because it appeared to him that the spreading was so abnormal and unusual. It certainly seemed to him much greater than it should be. The cure, to his mind, was a simpler one than Mr. Sinnott proposed—that was to put large stones in as strengtheners to the haunches. That had been done in many cases with good results. He would like to ask Mr. Sinnott whether he had tried that instead of this plan, which seemed to be expensive. He had tried the other plan himself with exceedingly good results.

Mr. R. Oakden (Newark Rural) asked whether there was any danger that these cross-ties would themselves cause corrugation. It appeared to him if the road had been worn four or five years, the road would give more than the places over the cross-ties and thus form a ridge.

Mr. W. Gregory (Royston), said he was particularly interested in this sub-movement of roads, because for the last eight or nine years he had been dealing with it. At the same time, he did not think this method dealt with the cause of it. He thought the cause of it was the moisture in the sub-crust. He had a road which was in a bad condition. It was made over the chalk, and the road was always in a moving condition. After draining it, the road had stood all the heavy motor traffic of the district for four years without movement. He had some roads made on the clay with narrow gullies on the surface at the side of the road, and underdrainage had been equally effectual. He thought the only way to take away the cause of movement was to take away the water. With one of his roads, on cutting down, he found 4 ft. below the surface in the yellow clay streams of water running. That made the road in a putty condition. He realised that Mr. Sinnott's system was a very good attempt at dealing with a difficult problem. He would like to know how he would deal with this in a narrow road, what would be the cost per mile, and how it would interfere with the traffic while the work was being done.

Mr. T. Caink (Worcester) said the trouble to which Mr. Sinnott had referred was by no means confined to country roads. He had had the trouble in old city roads to a considerable extent in this way, particularly during the rolling by a steam roller of roads with weak foundations. He could confirm Mr. Sinnot's observation that it was invariably in roads made on clay or marl, and he could also confirm the opinion of Mr. Gregory, that it was due to moisture in the foundation. It was often very difficult, and expensive too, to drain the subcrust under some circumstances. The effect of this lateral thrust had been to heave up the channels and kerbs against the footpath, and very often partially to ruin the footpath. The remedy he had applied was to put a concrete foundation under the channel and kerb, so as to give a strong wall to resist the lateral thrust. His fear of Mr. Sinnott's remedy was that he found it was when the weight came near to the channel that the greatest effect was produced, and if they attempted to steam roll a road arranged in the manner Mr. Sinnott proposed—partially tied in and the flanks unprotected—he would get the whole road in the same condition as it was originally. In fact, it was the outer edge of the road where the resistance abutments were required to be placed.

Mr. O. E. Winter (Hampstead) said he gathered from Mr. Sinnott that where a curve existed in the road through a village there was no trouble arising from this lateral movement.

Mr. Sinnott explained that the case referred to was rather a special case of a very narrow road with ferro-concrete path backed by houses, so as to secure absolute rigidity. They had the conditions obtaining there which he was seeking to obtain by artificial means.

Mr. O. E. Winter (Hampstead) said he had no trouble such as Mr. Sinnott had spoken of. He had always had a kerb by the side of the road, and where it did not exist he should hesitate to put in a bituminous material without giving it the support of a kerb or channel. A kerb of 12 by 6 or 12 by 4 should prevent the lateral movement such as referred to, and he should not think it would cost more than the figure mentioned by Mr. Sinnott of £500 per mile. He should say they would get a kerb for the price, certainly for bituminous material a kerb of that kind was essential.

Mr. H. F. Gullan (Belfast) supported the vote of thanks. He noticed that Mr. Sinnott brought before them the case in which the road was made on a clay subsoil, and apparently there was no form of drainage under the road crust. It appeared to him that the lack of drainage was the whole secret of the movement. There was the possibility of springs in the substrata, which might accentuate the trouble, but unless steps were taken to deal with the water in the subcrust of the road, even with the carrying out of Mr. Sinnott's suggestion, he might meet with trouble in the future. If the water remained, when heavy motor traffic came on the road, he would still find moisture gathering, and even the frames themselves would begin to bulge and sink in various ways. The system seemed to be intended to get over the difficulty of putting in a complete system of drainage under the road to relieve the water which was lying there, and then support the road against side thrust. He was inclined to think that a complete system of drainage would get over the difficulty.

Mr. A. P. I. Cotterill (Bristol) wished to emphasise what Mr. Gullan had said, and to ask Mr. Sinnott two questions. Was there not a danger in making a rigid arch in the subcrust like this frame, if water was left in the road, of sinking and causing danger to the surface? Second—Could not the remedy be found by reinforcement laid over the

[illegible] surface?

Mr. F. [illegible] said [illegible] the surface.

Mr. W. H. Grieves (Sutton) said the difficulty had [illegible] the gas, water, and all the other mains for which the roads were being constantly taken up. He had experienced the same difficulty as Mr. Sinnott on the main roads [illegible] kept or [illegible]. Instead of having the camber on the centre of the road the motor traffic had squeezed the subcrust under the footpath, and lifted it 18 in.; thus, instead of having the camber on the centre of the road, it was left with a depression. In a road which they put down with bituminous material a little over eighteen months ago he put a creosote deal board of 4 in. by 3 in., driven into the sides of the road and made rigid. Although that road had to stand severe and heavy traffic—being the main road from London to Brighton—it had not up to the present moved in the slightest. Mr. Dryland, the county surveyor of Surrey, had suggested another method of putting a block of 9 in. by 4 in. of concrete by the side of the road, left level with the bituminous material. He anticipated that that would act very well, but he had not heard the result at present. Mr. Caink suggested the putting in of a block of concrete under the channel and kerb. Where this lateral thrust had occurred under a road they had that done, they put concrete in under the kerb and channel, and the road had not moved.

Mr. R. J. Thomas (Buckinghamshire) said anything which would enable them to prevent this horrible spreading of the roads must be of advantage to their profession. His only doubt was whether the expense was justifiable, or, rather, whether simpler and more economical means could not be adopted. He had had recently to cut into an old Roman road, and he found the pitched foundation increased in size as it reached the side of the road, and there, he thought, was a solution of the difficulty. They wanted a thrust block under ground to prevent spreading—not so much the kerb or channel, but a block under the surface [illegible]. They would find that the subsoil on the sides of the road was more wet than in the centre. At the present moment he was preparing to restore two roads by putting in a hand-picked foundation of not less than 6 in. At the edge of that foundation they would lay stones of not less than 12 in., and his hope was that the large stone at the sides would prevent a lateral spread. He thought, as they came to the bituminous edge, that the water would be prevented from going into the subsoil, and that putting these blocks in and sealing them up, efficient drainage might reduce this injury. It was evident unless they put in a pitched foundation they must have some artificial method of preventing this lateral pressure and spreading on the roads.

Mr. D. Edwards (Taunton) thought one would agree that the intensity of the stress produced by any weight coming on the surface of the road would not be sufficient to set aside 5 ft. by 18 in. thick of macadam, as illustrated in the paper; also he would like to know at what depth Mr. Sinnott would place his recording instrument. It appeared to him that the depth at which the instrument was placed would be important as registering the amount of displacement. He could not think himself that any vehicles up to 15 tons, travelling on the side of the road, would produce such an amount of lateral displacement. It would appear to anyone not accustomed to rural roads that this 5 ft. by 18 in. was an old surface of a road which had been covered over by grass, and it would be the duty of the county authority to reclaim that portion which had been allowed to be grown over.

Mr. J. Edey (St. Neots) considered they were all faced with this difficulty. The alternative method he recommended to his committee was to dig a trench at the side of the road and fill in with rubble. That suggestion had not been carried out from want of funds. As an alternative he put down 4 in. of Rocmac, and that had overcome the difficulty. To make a thorough job of it they wanted to protect the haunches of the road.

Mr. F. R. Phipps (Basingstoke) said he had carried out the method which Mr. Boulnois had recommended. On his main Lenton road which carried a very heavy traffic, and which was laid on a clay subsoil, he had to take up 150 yds. of the road. The method he adopted to prevent the spreading of the road—the crown in places had been raised a foot—was to take up the crust of the road and make an abutment to the channel, to a depth of 2 ft., of hand-picked stone. At the side of the channel he put the same material 12 in. deep, hand-picked and rammed, and then the old material was laid on that. He found it was effective, and up to now there had been no movement.

Mr. S. Tebbutt (Southampton) wished to mention one fact which had come under his observation. The main question in this discussion appeared to be one of drainage. He rose merely to mention that their road surveyor when he first came to Southampton took off a lot of the crown of some of the roads because they were too high, and he deposited the gravel on a very low-lying piece of ground and raised it 5 ft., so that there was a bank of 5 ft. of gravel in places. He then eventually, after it had consolidated sufficiently, put on it a water-bound macadam road. That road he travelled over frequently, and he thought a finer piece of macadam road he had never crossed over in his life. There was absolutely no movement of any sort on it. It was like a track, and he was only recently saying to their surveyor if they could get roads made with water-bound macadam and then squeegeed with tar they would get as fine a road as it was possible to have.

The vote of thanks having been passed,

Mr. Sinnott then thanked the members heartily for the very kind way in which they had received these few notes of his, and Mr. Brodie for the kind way in which he had proposed the vote of thanks. With regard to the question of pitching, he agreed that where they could, and where they had a road with a thoroughly pitched foundation, their troubles might not exist. In Gloucestershire they had 1,000 miles of main roads, and there were very few with any foundation at all, and it was to meet difficulties in such a county as Gloucester that this suggestion was brought forward. Where they had a thoroughly pitched foundation, or a road was laid on rock, he did not think the trouble would arise. If they were faced with the state of things which existed in that county, and the heavy traffic on the roads, they would realise that they had got to deal with the roads either by pitching or by artificial means as suggested in his paper. He was greatly in favour of a subcrust drainage. He did not pretend that his method was going to supersede that. With the method he suggested it was possible to make an arch of tar-macadam which was impervious to water. If they could put in their sub-drains when putting in the frames their drainage would be much more effective. The difficulty he had was that the drainage breaks up. They had a clay foundation, with heavy traffic over it, and they put their drainage in, but it was nothing like so effective as it should be. With the plan which he had suggested, where their subcrust would be more protected, their drainage would be far more effective than any put in under the present methods. As to Mr. Boulnois' remarks about the old roads, he would only say that he would not mislead the meeting willingly, and he honestly believed that all the cases he had mentioned were *bonâ-fide* cases. One of them must be entirely due to this lateral movement. That was the road from Cheltenham to Circencester. That was a new road. He was perfectly certain that it had not been allowed to be overgrown. They had made a practice of gradually widening the roads out, and so they had got a little more than their forefathers had. The theory of an old road would not deal with the case mentioned in Fig. 2. A number of the stones had been turned right over and fallen back into the road. That movement could not be attributed to the antiquity of the road, or the road being of greater width at some other time. He could honestly say that he had opened the roads in the line of turnpike houses, and he had gone and taken the line. The road would certainly not have infringed upon the old turnpike house, and the movement had been behind that, showing that the thrust movement had been going on. Mr. Gregory referred to the question of moisture in the subcrust. His point was that they got their subcrust drainage far more effective on some method of this kind, and prevented the water getting in, owing to having an impervious arch. Mr. Caink made a remark about the movement being apparent at the sides. They saw it at the side of the roads, but it began in the centre. He was rather in

an experimental stage with regard to this work himself. It was all open to modification as time went on. He honestly believed that the movement began in the middle of the road, because certainly in that county Gloucester quite 90 per cent. of the heavy traffic travelled in the middle 8 ft. or 10 ft. of the road. Mr. Warner referred to the putting down of a kerb. This was really the same kind of thing. If a kerb would meet the case, then he said put in a kerb. But his experience had been that the kerb was not enough, and if they were going to get any movement at all they must go the whole length of the road and absolutely prevent it. He had overlooked Mr. Oakden's remark and a very good one that the cross-ties would produce a wave or undulation, or rather a wavy surface. If they looked at his drawings they would see the cross-ties were lower than the longitudinals. He put them lower so as to have a greater amount of cushioning. It was not a question how near the surface they could bring the cross-ties. If he found they did interfere they would be put lower. It might turn out they were rather too high, or it might be better to have a modified from of cross-tie. Then one speaker asked him how he should manage in a narrow road where they had considerable water finding its way to the subcrust. He should be rather inclined there to put down the method he had tried of having the cross-ties so that they could be in the middle. They could make their connections by overlapping, or it might be put in concrete in situ, and that would extend to the centre of the road. There were practical difficulties in the way of putting things of this kind in, but where that was serious the best thing was to make the cross-ties in two pieces, or put it in concrete in situ. One or two speakers raised the question of the difficulty of pipes in the roadway. The whole thing was 18 in. below the surface, and he did not think that would interfere with pipes to any material extent. His idea was that the pipes were considerably lower than that, and that it would not interfere.

A member said it was a question of putting in the pipes with the longitudinals.

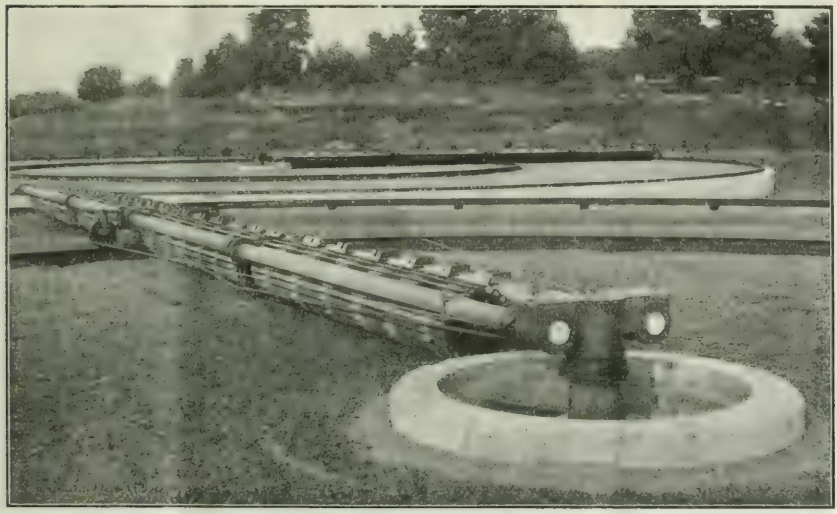
Mr. Sinnott said there would be one advantage if they did not carry out his system to the sides of the roads. Then he took it that it was becoming more common to put the pipes under the paths. They could not have a perfect road surface if they had to be perpetually cutting up the road for putting in or repairing pipes. One speaker had referred to the measuring arrangement. He did not know, but he imagined it might be possible to measure the pressure, but what he wanted first to get at was the rate of movement—was it ¼ in., ½ in., or 1 in. a year? His feeling was that whatever the movement was it was quite enough to let down the surface. Then they came down to the question of cost. He did not think in reason any cost was too great, if they could permanently have something below their road which could last them for all time. He was not referring to the frame itself, but to the cost of putting them in. The interest on the amount was £25 per mile per annum. One ought not to be baulked by the initial cost if they were going to keep up an expensive road surface. He did not propose to put in the recording instrument more than about 18 in. below the surface. He did not find any vertical settlement. On his roads with the heaviest traffic, 18 in. below the surface he did not find that the material was being pressed downwards. Apparently the movement was not vertical, unless the road was laid on a bog. He might say he had got one of the frames made, and it was lying on the road between there and Gloucester, about 2 miles distant. These ferro-concrete frames were absolutely rigid. They would arrest any movement likely to be initiated by the passing traffic. Of that he was confident.

(To be continued.)

THE "JandA" SEWAGE WHEEL DISTRIBUTOR.

INSTALLATION AT CHELTENHAM.

The accompanying photographic view shows the type of sewage distributer in use at the Cheltenham Corporation's disposal works. They are the "JandA," manufactured by Messrs. Jones & Attwood, the well-known firm of hydraulic engineers at Stourbridge.



"JandA" Sewage Distributors at Cheltenham.

There are ten filters, each 101-ft. diameter, and the selection of distributors was made after searching inquiries, experimental tests, and finally of a test of nearly four years of two full-size distributors, before the remaining eight were ordered.

The chief points of advantage are that no small holes are employed, the edges of the waterwheel buckets throwing off the liquid in fine drops over the whole filter surface in very small doses, and at any rate of flow, while the feed weirs allow of exact adjustment to give even distribution over all parts of the filter at any varying rate of flow.

£125 Concrete Cottage Competition.—The result of the Concrete Cottage Competition organised by *Concrete and Constructional Engineering* will be made known in the July number of that journal, which will be issued to-morrow (Saturday). The exhibition of the 249 designs sent in will be held at the Surveyors' Institution (Lecture Hall), 12 Great George-street, Westminster, S.W., from July 6th to July 11th, between the hours of 11 a.m. and 6 p.m. The assessors, it will be remembered, were Mr. Max Clarke, F.R.I.B.A., Prof. Beresford Pite, F.R.I.B.A., and Mr. Edwin O. Sachs, F.R.S.(ED.).

Sewage Disposal at Leyton.

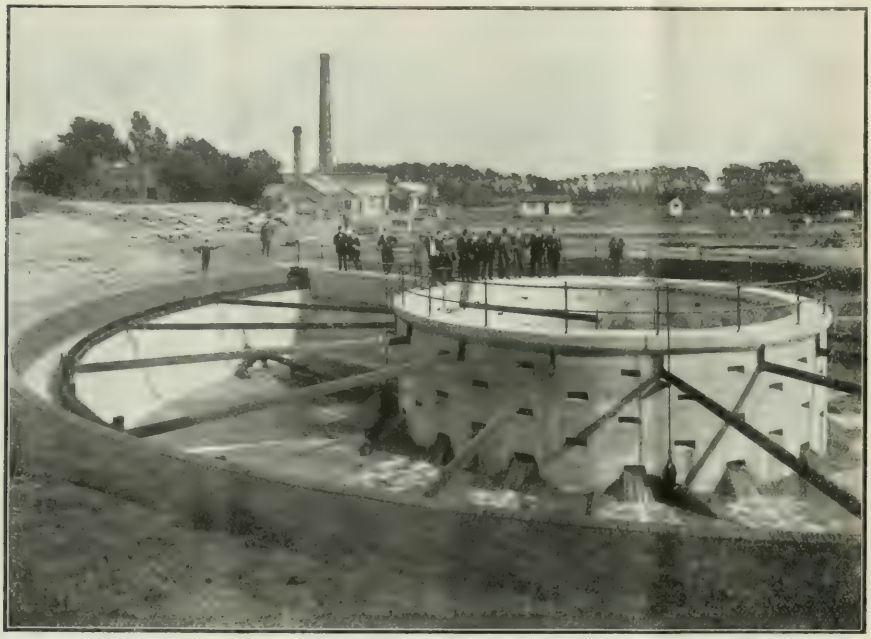
ADDITIONAL TANK ACCOMMODATION: GUILDFORD TYPE ADOPTED.

[illegible] at Leyton [illegible] in tanks. [illegible] the storm waters are passed over 3 acres of osier beds adjoining. [illegible] land [illegible] tanks [illegible] in [illegible] constructed in 1892, at a cost [illegible]. The population of the district was then 50,000, and the sludge level of the tanks down to the sludge level was about 920,000 gallons. The daily dry-weather flow was, approximately, 600,000 gallons, or [illegible] allowed, with one tank laid aside for sludging, for eighteen hours' rest for the day sewage and ten hours' rest for the night sewage.

In 1902 three additional tanks were constructed at a cost of £[illegible], increasing the working capacity up to 1,710,000 gallons; the population had then increased to [illegible], with a dry-weather flow of about 1¾ million gallons, or a maximum flow of 660,000 gallons in six hours. This, allowing two tanks laid aside for sludging, provided for about twenty hours' rest for the day sewage. No extension to the tank accommodation has been made since 1892, although the population has increased to 128,000, and the daily dry-weather flow to 2¾ million gallons, or a maximum flow of 1,400,000 gallons in six hours. This is equivalent to filling five tanks in six hours, by the end of which time the first tank must be emptied, as there are usually two tanks standing idle for sludging. The time in which the sewage is allowed to stand in the tanks is therefore reduced to under three hours, and it has not become quiescent before the effluent has to be run off. As a matter of fact, during the past three months the available period of rest in these tanks during the whole of the twenty-four hours has only been two hours and ten minutes; so that it is a matter of impossibility to obtain an effluent at all approaching the standard attained previously. The present daily dry-weather flow is equivalent to filling twelve tanks, and five additional tanks of similar capacity to the present ones would now be required to give a tank capacity equal to one day's dry-weather flow. The provision of two additional rectangular tanks would give at work seven tanks, which would take nine hours to fill at the period of maximum flow, and this would increase the period of rest for the sewage in these tanks from two hours to between five and six hours.

The advisability of providing this additional tank accommodation was brought before the notice of the Public Health Committee on many occasions, and on March 8, 1910, Mr. Dawson, the then surveyor, presented a plan showing two proposed new rectangular tanks similar to the existing ones, and reported that he had taken out quantities and prepared an estimate of the cost of the work, which, including 5 per cent for contingencies, amounted to £3,365. In view of the negotiations then pending with the London County Council for connecting up the sewerage system of the district with that of the London area, it was felt advisable to postpone the consideration of this matter for a time. The negotiations culminated in the London County Council provisionally agreeing to take the sewage of Leyton, Walthamstow, Edmonton, Enfield and Southgate into the London system. The London County Council were prepared to receive and treat 50 gallons per head per day—that is, 6½ million gallons daily—but not more than 3½ million gallons were to be discharged in any six consecutive hours. This means that 3½ million gallons can be discharged directly into the outfall sewer, and 1¾ million gallons into the present tanks, making a total of 5,000,000 gallons, or 500,000 gallons less than twice the daily dry-weather flow. As the remainder of the storm water can only be run on to the 3 acres of osier beds adjoining, it is evident that additional storage accommodation will become compulsory when the system is connected with that of the London County Council.

Although Edmonton, Enfield, and Southgate have now withdrawn from the scheme which was formerly advocated by these authorities, there has been no suggestion that Leyton and Walthamstow should follow the same course, and the representatives of Leyton and Walthamstow are now in communication with the London County Council for the purpose of



NEW CIRCULAR TANK AT LEYTON SEWAGE WORKS.

arranging terms as confined to the two authorities, indeed reviving the original proposition for dealing with Leyton and Walthamstow. The altered terms, if any, will only be of a financial character, and will in no way affect the limit as above stated.

It was felt that advantage should be taken of these circumstances to make immediate provision to some extent for this necessary increase in the tank accommodation and utilise it for the present to assist the precipitation process, thereby enabling an increased length of time to be allowed for the sewage to stand quiescent before being discharged into the effluent channel. It is not desired to contend that the increase in the tank accommodation can enable an effluent capable of meeting all future requirements to be turned out, but it is felt that the addition will assist in turning out a better effluent than at present, and help to tide over the difficulty until the negotiations, which have now been extended over a considerable number of years, can be completed for the discharge of the sewage at the London outfall. In November, 1912, the committee's attention was called to the circular tank constructed at Guildford at the end of 1910, and to the advantages of this design compared with the existing rectangular tanks—briefly as follows:—

(1) The tank does not cover so large an area of ground as would be required for the two rectangular ones.

(2) It is cheaper to construct, requiring 30 per cent less respectively of brickwork, of concrete, and of cement rendering.

(3) The sewage has a more equable velocity through the tank, being obliged to flow in an upward direction and to travel from the centre to the circumference.

(4) There is better clarification or subsidence, and where chemicals are used a better result for the same quantity used per gallon.

(5) The solids are not disturbed by the inflow, but are deposited in sludge pits, where they can be regularly and easily removed.

(6) The tank has always the same capacity, owing to the facilities provided for the periodical removal of the sludge and scum.

(7) The large weiring surface allows increased volumes of sewage to be dealt with without disturbance of the scum or solids, ½ in. over the weir being equal to the full area of the 2-ft. 6-in. inlet pipe.

(8) No aerial nuisance is created, owing to the tank never requiring to be emptied for sludging.

In December, 1912, the chairman of the committee and the engineer, Mr. Ernest H. Essex, ASSOC.M. INST.C.E., visited Guildford, to inspect the tank at work there, and a plan was afterwards submitted for a tank at Leyton on similar lines, and instructions given to prepare working drawings for same. These were submitted in February, 1913, with an estimate of the cost, amounting to £2,255, not including royalties. The council advertised for tenders to be delivered at the council meeting held on May 27, 1913, and the lowest tender—that of Messrs. W. Manders & Co., for £2,236—was accepted, subject to the sanction of the Local Government Board being obtained to borrow the money.

The comparative cost of construction only, based upon the actual prices in the accepted contract, of two rectangular tanks, compared with the circular tank is as follows:—

	Two rectangular tanks. Capacity 250,000 galls. each. Cost.	Circular tank. Capacity 500,000 galls. Cost.
	£	£
Excavation	587	382
Concrete	681	452
Brickwork	132	92
Rendering	300	214
Scum boards	15	30
Effluent and outlet pipes	95	197
Sludge and inlet culverts	352	119
Valves and ironwork ...	400	650
	£2,562	£2,136
Contingencies	138	100
	£2,700	£2,236

The nature of the subsoil, however, was such that the ballast lay 11 ft. 9 in. below the surface, below which depth it was all ballast and sand, which would not have been available had the two rectangular tanks been constructed, and the extra cost of this more than pays for the royalty of £250 paid to the patentees of the tank.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why is it that at the meeting at Cheltenham there was such a large attendance of delegates at the Town Planning Conference and such a relatively small attendance at the Roads Conference? Was it because the delegates attending the former conference were able to charge their expenses to the rates, whereas those attending the road conference were unable to do so? Is not the question of good roads quite as much a national question as that of town planning?

* * * *

Was it not stated by the surveyor to one of the smaller local authorities, during the discussion on town planning, that in the district he represented, if he purchased a couple of spades and a few buckets for his sewage farm it affected the rates? And was he not understood to say that a 1d. rate in his district produced the large sum of £3 10s.?

* * * *

Was not Mr. Sinnott's suggested reinforced-concrete frame to prevent subcrust movement in roads rather an heroic method of dealing with this problem? And would not the more simple expedient of strengthening the haunches with either a deep kerb or large stones be sufficient?

* * * *

What will be the result of making all the past-presidents of the Institution of Municipal and County Engineers ex-officio members of the council? Will they not swamp the ordinary members of council, or will their age and distance from London prevent their attendance at the council meetings? On the other hand, should not their "ripe experience" be of some service to the council in their deliberations?

* * * *

What is the reason that the Benevolent Fund of the institution is so little supported by the members? Is it a fact that only about 13 per cent of the members subscribe to the funds? And will the Ladies' Committee, which was formed at the annual meeting of subscribers held at Cheltenham be the means of inducing a far larger number of members to subscribe to this useful and excellent movement?

* * * *

Was it not very interesting to hear from Mr. Hadfield, of Sheffield, that, notwithstanding a very large amount of motor-omnibus traffic in that city, the annual cost of maintenance of the roads had decreased considerably? And were we correct in assuming that this was mainly due to the improved bituminously bound roads which had superseded ordinary water-bound roads?

* * * *

What progress has been made with Dr. Gilbert Fowler's process for oxidising and coagulating sewage with the "M7" organism, and treatment with air? Have the experiments yet shown that this proposed treatment can be adopted on "commercial lines," or is it still in the stage of experiment? If these experiments prove a success, will not this process reduce the area of land now necessary for costly works of sewage purification, and will not the effluent obtained meet the most stringent requirements?

* * * *

Has anyone tried the experiment of lightly tapping with an umbrella or walking-stick the seat of a railway carriage? Would he be surprised that in a very few minutes he can cover the seat with about $\frac{1}{16}$ in. of dust? And when will the railway companies adopt a more sanitary covering for the seats of their carriages, and avoid "stuffing" and upholstery as much as possible?

* * * *

What is meant by "speeding up" the Local Government Board, which the newspapers say is the aim of the present President? Was it not the late President of the board who was always talking about "efficiency," and will not the board under these two Presidents attain such a high standard that even the War Office will be placed in the shade?

* * * *

Who was the poet who wrote the following lines?

What though the town be large, the buildings tall;
Neglected, ill-paved streets will spoil it all.

And is there not much truth in this philosophical poetry?

* * * *

Why should one ever buy an evening paper when the posters are so much more thrilling than the contents?

Chicago Sewage Disposal and Water Supply.

[Extracts from the report of the Board of Experts appointed by the Chicago Real Estate Board, and consisting of Dr. G. A. Soper, of New York, and Messrs. J. D. Watson and A. J. Martin, MM.INST.C.E., of England.]

[illegible] the plan of main drainage and [illegible] sewage is based on the [illegible] Lake Michigan [illegible] and that the purity of the water can be insured if the sewage is prevented from flowing directly or indirectly into the lake.

[illegible] built to dispose of the sewage [illegible] on the theory that it would be impossible to [illegible] the sewage of the city into the Chicago River, and flush it with a certain amount of diluting water from the lake, by means of the Sanitary Drainage and Ship Canal, into the Desplaines River system, which ultimately empties into the Gulf of Mexico.

It appears that the theory underlying the plan of disposal [illegible] was decided upon before the works were constructed, and the organic law providing for the creation of the sanitary district specified the allowance of water which was to be provided for diluting purposes. It has been stated since the canal was built that the ratio of sewage to water required for the disposal of the sewage represented a minimum, not an average or maximum, figure, and that it referred to the sewage of a mixed residence and business territory from which unusual amounts of troublesome trade wastes were excluded. The accuracy or otherwise of the statements has little bearing on the situation. The conditions of sewage disposal which exist in the Chicago River and its outlet are conceded to be unsatisfactory, and it is the opinion of your board of experts that the disposal of the sewage cannot be made to answer the reasonable demands of sanitation without radical improvement.

DISPOSAL BY DILUTION.

The disposal of sewage by discharging it into a natural body of water, as is done by Chicago, is termed "disposal by dilution." This is the most common method of disposal in America, and there are many instances in which it is employed without producing serious nuisance or injury to health. On the other hand, there are many cases in which nuisance and harm to health have resulted, and it has become the growing practice of cities to divert their sewage from watercourses into which their drainage formerly discharged and carry it to more or less distant points for treatment. Under such circumstances the form of treatment varies from the removal of the grosser suspended particles which may cause offence to sight and the removal of the suspended solids which are capable of depositing in the water and producing offensive odours to filtration and the oxidation of a large part of the organic impurities. In but few cases has it been found possible to utilise the manurial ingredients either by applying the sewage to agricultural land or by extracting them and preparing a commercial fertiliser. However possible it may be in future to recover the useful ingredients of sewage, it is now universally agreed among sanitary experts that the first and controlling object should be to dispose of the sewage without injury to health or the creation of nuisance.

IMPORTANCE OF PREVENTING NUISANCES.

In recent years the prevention of nuisance has been recognised to be of large and increasing importance. In considering the existence of objectionable conditions in the Chicago River and its outlet, it is necessary that a clear understanding be arrived at as to what conditions constitute a nuisance. The word "nuisance" represents a conception which does not admit of precise definition. The courts have frequently been called upon to deal with it, and sanitarians are compelled to face it in innumerable forms.

Generally, a nuisance may be considered as a condition or set of conditions working harm to one or more persons through an assault or offence to the sense of decency, propriety or comfort. The effect is positive, not slight or partial. An odour or a sight which seriously disturbs the peace of mind which is necessary to the ordinary vocations of life may constitute a nuisance.

Obviously, what is a nuisance to some may not properly be called a nuisance by others, there being marked differences in susceptibility to the disturbing conditions among persons of different sensitiveness. In a [illegible] nuisance does or does not exist a reasonable and [illegible] of the facts should be arrived at, and the susceptibility of the average person who is affected must be accepted as the gauge.

It is worthy of remark that a nuisance cannot exist without reference to those persons who may be affected by it. The putrefaction of sewage may proceed to the point where the most foul-smelling and other objectionable consequences are produced; but if there is nobody in the vicinity the conditions cannot be said to constitute a nuisance. Conversely, a very small amount of putrefying sewage in the midst of a crowded section may be so objectionable as to constitute a nuisance in the fullest sense of the word.

NUISANCES FROM CHICAGO SEWAGE.

In the light of foregoing remarks it must be obvious that the putrefaction of sewage should not be permitted in the closely built up sections of cities, but may be allowed to proceed in rural districts remote from habitations or places of work, and not passed by vessels or vehicles of transportation by land.

Applying the conception of nuisance here described to the condition of the waterways of Chicago, it may be said that nuisance exists in various places in the contributing arms of the Chicago River and not to a considerable extent, so far as the personal observations of your board of experts have extended, in the main channel from the lake to the drainage canal. Practically the entire watershed of the Chicago River is populated or soon will be built up. The drainage channel flows through the open country for many miles, and its condition, although observed to be foul by those who have had occasion to visit it, does not constitute a nuisance for the reason that none is compelled to reside or work within the sphere of its offensiveness.

Some modification in the ordinary acceptance of the term should be made at the present time in considering the application of the term "nuisance" to the Chicago conditions. The condition of the waterways, however, is relatively so much better in most places than formerly that the public may be expected to be generous in their criticism. Complaint is not likely to be so vigorous where a decided change for the better is seen to have been made. In course of time, however, it may reasonably be expected that the sanitary standards of those who are now lenient may become more exacting, so that it will not be safe to assume that Chicago's waterways can properly be allowed to be more polluted than the waterways of any city where the education and intelligence of the public are at a high level.

RESPONSIBILITY FOR NUISANCE FROM SEWAGE AND FROM TRADE WASTES.

There is another consideration which in some degree mitigates the exceedingly foul condition of some of the city's open waterways. Odours of a peculiarly offensive and pervading character exist from certain industrial establishments in close proximity to points of excessive sewage pollution. The pollution adds to, but does not create, the original offence. From the standpoint of some it is far less objectionable to maintain the sewage nuisance in the presence of the greater trade offence than it would be to maintain that in the best residence or business districts.

Excuse upon this ground is fallacious. The existence of one nuisance cannot condone another; nor is it reasonable, where many persons are affected, to aggravate an offensive condition of the atmosphere by the addition of another. Aërial nuisance may or may not be prevented. In so far as it relates to the pollution of the waterways by sewage which, for other reasons, can and should be disposed of in a sanitary manner, nothing short of radical improvement should be regarded as satisfactory. A municipality cannot equitably insist upon the prevention of an aërial nuisance from a manufacturing establishment if the sewage is not properly disposed of.

Nor does it make much difference whether the pollution of the open watercourses is due to public sewage

or trade wastes. If the wastes are recognised to be a public charge, it is incumbent upon the public officers to dispose of them. If responsibility for wastes devolves upon the manufacturing establishments, it is but reasonable to require that the proprietors of the establishments shall dispose of the wastes without serious harm to the public welfare, or pay the municipality for disposing of them.

QUALITY OF THE WATER SUPPLY.

The vital statistics of the city have been quoted to your board of experts to show that the present method of sewage disposal adequately protects the drinking water against infection. The lowered death-rate and the typhoid death-rate have been taken to indicate the measure of this protection. The vital statistics of Chicago have been compared with those of large cities whose drinking-water supplies have been filtered, and it appears to have been shown that Chicago has one of the cleanest and purest waters of any large city in America. It seems unnecessary in this place to review the evidence or inquire whether all the improvement in the death-rate and typhoid rate is to be ascribed to the water supply. It is sufficient to remark that there seems generally to have been sufficient protection afforded up to the present time.

The method of disposing of the sewage is not the only protection which has been taken against the transmission of disease by means of the drinking water. The intake cribs, of which there are six, have been extended further and further out into the lake until one is about 4 miles from shore. If the reversal of the flow of the Chicago River is complete, and no sewage is discharged into the lake, it is difficult to understand the necessity for placing the intakes so far from the land. Again, it is not apparent why one of the intakes should be 4 miles from shore and the others between 2 and 3 miles from the land. Apparently the object in placing the intakes out as far as practicable into the lake has been to avoid not only contamination along the water front, but to get water which is clear. At times of storm the water of Lake Michigan becomes turbid near shore, clay being conspicuously present. After fresh easterly winds even the best water obtainable from the 4-mile crib becomes noticeably turbid.

As a means of protecting the water supply against occasional and accidental pollution from vessels which may have occasion to pass near the intake cribs, steps have been taken to place tanks upon the boats to receive their sewage. Arrangements have been made at some of the intakes for the application of hypochlorite as a temporary or permanent procedure. It appears from statistics collected by the health department that those parts of the city which have been supplied with this disinfected water have been particularly free from typhoid fever.

CONDITION OF THE DESPLAINES AND ILLINOIS RIVERS.

The condition of the Desplaines and Illinois rivers with respect to pollution has produced a strong impression on the board of experts. On the days when the inspections were made the water was offensively polluted with sewage as far as Ottawa—85 miles from Lake Michigan. Where bridges crossed the stream it was possible to see unmistakable evidences of the sewage. Odours were noticeable, grease lay upon the surface of the river, dead fish were numerous, and large quantities of sewage fungus were observable in the water. Disagreeable odours were noticeable at a distance of nearly one-quarter of a mile from the Marseilles dam. Above this point your board is informed that animal and vegetable forms which are natural to a normal river are absent. Through the whole course of the stream from Chicago to and below Ottawa gulls were seen feeding on the solid refuse which the sewage brought down. That Joliet and other municipalities along this watercourse discharged their sewage and industrial wastes into the water, and that the condition of the stream is now better than it was in former years, does not excuse Chicago for discharging the sewage, which forms the great burden of polluting matter observed.

OPINIONS AND SUGGESTIONS.

To the foregoing brief statement of the situation as it is now regarded by your board of experts the following opinions and suggestions are added:—

Dilution alone cannot be relied on as a permanently satisfactory method of disposing of the sewage of the district. It offers an insufficient means of disposing of the sewage at the present time, and would prove still more inadequate in the future, in spite of the full quantity of water which the drainage channel can carry. It will ultimately be necessary to treat practically all the sewage before it is discharged.

The procuring of a satisfactory water supply by diverting the sewage to the drainage channel, and extending or altering the location of the intakes, is not capable of furnishing a drinking water of sound quality. For the protection and improvement of the supply the city should look forward to the construction of filtration works.

The conditions of sewage disposal and water supply which now exist are not so insanitary as to call for improvements which will involve immediate and large expenditures of money. Conditions which are insanitary in the extreme exist in places, but they can be corrected without excessive cost. The great need is for a definite and carefully worked out sanitary policy for the future.

The disposal of the sewage by discharging it into the drainage channel after suitable preparation, the protection of the water supply by diverting the sewage from the lake, and the maintenance of conditions in the Chicago river suitable for navigation, are closely connected subjects, and the provisions to be made in future for sewage disposal, water supply and shipping should be worked out with this fact clearly in mind.

The preparation of comprehensive plans for sewage disposal, water supply and river development should be undertaken immediately. In order that this work may be of greatest service it should be based on a thorough knowledge of the existing conditions of population, residence and industrial development, sanitary requirements, and in accordance with careful estimates of the future of the city. Generous support, including abundant appropriations of money, should be given to the investigations, planning and other scientific work which may be necessary in this connection.

SOME RECENT PUBLICATIONS.*

WATERWORKS ENGINEERING. By Fred. C. Uren, M.INST.C.E., Ireland Silver Medallist in Civil Engineering, engineer and surveyor, Aldershot Urban District Council. Price 10s. 6d. nett. Bristol: Castle Litho., Limited.

It is perfectly true that there have been published a large number of books on the subject of waterworks engineering, but, as the author says, the chief merit of some of these books lies in trying to obscure the subject with elaborate engineering formulæ that benefited few persons who were not familiar with the calculus. Mr. Uren has avoided this in the excellent and practical work which he has written, and any student or engineer with a slight knowledge of ordinary mathematics can readily grasp the various simple and useful formulæ contained in the book.

The author, in simple language, covers a great deal of ground, from rainfall on gathering grounds, through reservoirs and dams, up to mains and distribution, with useful chapters on rivers and streams, wells, pumping, gauging and geology. Very few words are wasted, and the information given is sound and useful. The illustrations are well done, and not too elaborate in character.

It would be impossible in a short review to particularise the excellent manner in which Mr. Uren has dealt with his subject; but his chapter on "The Flow of Water in Pipes and Channels," and his explanation of the "hydraulic mean gradient" is a type of the simple and explanatory manner with which he deals with a subject which is so often terribly confused and unattractive to the student or practical engineer. We congratulate Mr. Uren on his book, which should be on the bookshelf for reference by anyone who has to deal with the question of water supply on either a large or small scale. We know of no book hitherto published which is such a veritable *multum in parvo* on the subject of water engineering.

CONTINUOUS AND ALTERNATING CURRENT MACHINERY. By S. H. Morecroft. Price 7s. 6d. nett. London: Chapman & Hall, Limited.

This work is, as described in its subtitle, an elementary text-book for use in technical schools. Its appearance is justified by the increasingly important place which is being taken by applied electricity as a subject of technical instruction. The author has kept in view the importance of simple, non-mathematical explanations of the behaviour of the various machines

*** Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.**

[illegible] has been introduced only [illegible] in the form of a [illegible] a [illegible] [illegible] [illegible] the [illegible] Series.

SLATE BEDS AT HALSTEAD.

ECONOMICAL WORKING.

Members of the Essex branch of the Sanitary Inspectors' Association made an inspection on the 29th ult. of the Halstead Urban District Council's sewage works, a feature of which is an installation of Dibdin's slate beds, the successful operation of which was, it appears, most instrumental in effecting a saving of more than £100 on the previous working expenses.

Mr. J. A. Dobson, who was among the company present, furnished some particulars with regard to the scheme, the expenditure of which, it was stated later, had amounted to only £1,800. The population of Halstead was about 6,000, and the problem set the council was to do away with the nuisance created by their farm, of which there had been many complaints, more particularly with regard to the sludge. The situation was becoming dangerous, and the council were running a great risk of having an injunction served upon them by the owners of the surrounding property in consequence of the great nuisance existing. Their endeavour was to avoid putting down an expensive scheme such as would necessitate a loan to be sanctioned by the Local Government Board, and they simply contented themselves with overcoming the nuisance at the least possible cost.

Mr. J. P. Humphrey (Reigate) said he would like to know the extent of the ill effects of the tannery waste upon the working of the slate beds in destroying the animal life, the essential element of the scheme.

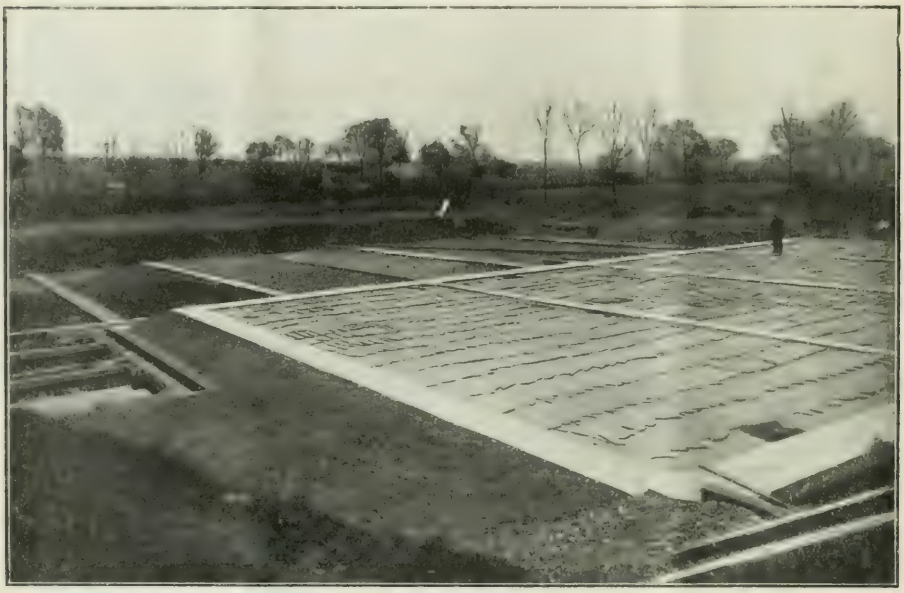
Mr. Dibdin replied that this depended upon the nature of tannery waste, as in the case of lime it would be precipitated in the grit chamber and little harm would be done; that in the case of Halstead, however, the tannery waste was to a certain extent counterbalanced by the waste from the brewery. Replying to other questions, Mr. Dibdin said the beds were never cleaned out, as they could not be choked, and explained that excessive use, instead of choking the beds, changed the bacteria process to a liquefying one which prevented choking.

Mr. W. A. Nicholson, the surveyor to the council, added that they only filled one of the six beds at a time.

Mr. Dibdin said Halstead did not possess a complete scheme. In some places they had to put in storm beds. Every place had to be treated according to its circumstances. For instance, at Halstead the slates were 2 in. apart, and in some they might be 4 in. apart, or only 1½ in.

Mr. H. W. Webb (Epping) inquired how chemical waste could be dealt with.

Mr. Dibdin replied that if the chemicals were so strong that they killed the worm life in the beds the system would naturally fail without preliminary chemical treatment, but he had not met such a case, as the chemicals were in solution, and the slate bed had to deal with matters in suspension which were being constantly digested by the biological organisms immediately after the solids had settled and when the liquor containing the chemicals had been drawn off, leaving the solids resting on the mudlayers in the presence of air. The system could be tested at home by pouring the sewage daily in a certain quantity on to a bed even a few inches only in extent. They had not come across any cases with which they could not deal, although difficult problems were presented in large manufacturing towns.



Halstead Sewage Works. View of Slate Beds.

Mr. Webb said at Oldbury the main sewer became choked with the chemical solids, and Mr. Dibdin pointed out that such heavy chemicals could be settled in a grit chamber before the sewage passed to the beds.

Mr. Nicholson observed that they had been working for five years and only one filter-bed had had to be taken off during the time. The slate beds had not choked at all.

The Road Board. The Chancellor of the Exchequer was asked in the House of Commons on Monday (1) what is the staff of the Road Board, and (2) how many meetings of the Road Board were held in 1913-14, and whether he would give a list of the attendances of the members. Mr. Lloyd George said the permanent staff of the Road Board is as follows—namely, secretarial and clerical, twenty; engineering, seven. There are also two consulting engineers, one of whom is employed for Scottish work, and a temporary staff of nine, employed mainly on the classification of roads. Seven meetings of the board were held in the year ended March 31, 1914. The chairman and one other member attended all of the seven meetings, two more attended five each; one, who was only appointed in July, 1913, attended four, while Sir Charles D. Rose attended the only meeting held before his death.

The Surveyor

And Municipal and County Engineer.

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INSTITUTION OF MUNICIPAL ENGINEERS.

SOUTHERN DISTRICT MEETING.

A meeting of the Southern District of the institution was held at the institution offices on Wednesday, June 24th. After the business meeting had been concluded, Mr. T. C. Barralet read the paper "Temporary Buildings in Relation to By-laws," which had been presented at the last annual meeting, and discussion of which had then been adjourned. [See THE SURVEYOR, November 14, 1913.]

Mr. Horace Boot, president, occupied the chair, and, in proposing a vote of thanks to the author of the paper, expressed the opinion that a short paper such as that read by Mr. Barralet was often the best. He quite agreed with the author that galvanised iron buildings were not the class of temporary building that should be practically insisted upon by the Local Government Board. Such buildings should, as a matter of fact, be discountenanced in every possible way, as unsightly and a blot upon any landscape. He mentioned, too, the deplorable extension in recent years of bungalow towns, which had ruined the foreshore of more than one seaside resort. Old railway carriages, with sundry leans-to, were largely in use as week-end residences, and some limit should be put to their erection.

Others who joined in the discussion, which was of quite an informal, round-table order, were Messrs. Thomas Mundy, John Taylor, Arthur Palmer, and A. J. Elson.

Mr. Barralet, in reply, said that galvanised iron buildings were the outcome largely of a craze for cheapness. The Model By-laws were responsible to a great extent for the existing condition of things as regards temporary buildings. They were not on a sufficiently wide basis for country places. Proper accommodation was not provided by owners of property for the poorer tenant, who was compelled to put up small lean-to and other buildings. Bicycles, perambulators, and mangles were among the items for which provision in these times was a necessity, and the space indoors was so limited, with every available corner used, that no amount of contrivance could give him what he needed. Outbuildings should certainly be provided.

VISIT TO THE ENDERBY QUARRIES.

Under brilliant weather conditions, the members of the Eastern and North-Eastern Districts of the institution and their friends visited the well-known granite quarries of the Enderby and Stoney Stanton Granite Company, Limited. Small as was the attendance, it was amply compensated for by the interest of the proceedings, and a thoroughly enjoyable and instructive day was spent. The party consisted of Messrs. N. E. Dixon (Oundle), J. H. Sharp (Rugby), R. Morris (Southwell), A. Harford-Stevens (Blaby), W. H. Blount (Market Harborough), H. Chapman (Blaby), W. G. J. Clark (Wigston Magna), F. Tucker (Hinckley), A. C. Dixon (Leicester), C. E. Barton, junr.; and, as representing the company, H. J. Grace (chairman), Jas. Marshall (secretary), F. J. Lycett, H. Hevitt, M. D. R. Richardson, and W. H. Bolley. Mr. G. Belson Chilvers, honorary secretary of the combined districts, and B. Wyand, secretary of the institution, also were present.

The party were met at Leicester Midland Railway Station and driven straight to the Grand Hotel, where lunch was served, Mr. H. J. Grace presiding. Time being limited, speeches were dispensed with until later, and the party proceeded in conveyances to the Enderby quarry. This is one of the many quarries owned by the company, the full list comprising, in addition, the Narborough, Redhill, Huncote, Earl Shilton, Stoney Stanton, Granitethorpe, Sapcote, and Tyddyn Howell (North Wales) quarries. The company now form one of the largest granite quarrying industries in the United Kingdom, and they have an immense output of kerbing, channel stones, broken stone for macadam, tarred stone, chippings and screenings for concrete, stone for bacteria beds, and rubble for road foundations. They are also the licensed producers for Durax dustless roads, and much interest was evinced by the visitors in the special machine for making Durax setts. The process of splitting large rocks by small charges of powder was shown, and was followed by three "blasts," which dislodged some 2,000 and more tons of stone.

A move was then made for the Huncote quarry, where there was a similar exhibition of blasting and of rock splitting. Photographs of the various blasts, together with one of the visitors, were taken during the journey, but it is to be feared that they shared the fate of much of the amateur work, which does not go beyond the film or plate stage.

On the return journey the Narborough and Redhill quarries were passed, but time did not permit of deviation. Arrived at the hotel, tea awaited the visitors, and on the conclusion of the meal a vote of thanks, proposed by Mr. N. E. Dixon, and supported by Messrs. W. H. Blount and H. Chapman, was unanimously carried for the kindness of the company in entertaining them as they had done that day.

Mr. G. Belson Chilvers apologised for the absence of the president and of many members, who had been detained on meetings and other business. He was really disappointed that there had not been a larger muster, especially having regard to the splendid programme and the very lavish hospitality. He hoped that an opportunity might be afforded them to pay a further visit in a year or two's time, when he would guarantee a really good attendance.

Mr. H. J. Grace, in returning thanks, expressed the pleasure it had given him to welcome the members on behalf of his company. He, too, regretted the small attendance, but extended at the same time a most cordial invitation to come again—not in a year or two's time, but during the present season. He quite appreciated the difficulty of getting a large number together on a Saturday.

A NEW METHOD OF SEWAGE TREATMENT.

By C. H. COOPER, M.INST.C.E.,
Borough Engineer and Surveyor, Wimbledon.

The S.O.S. Company have entered into a contract with the Wimbledon Council to take all the sludge produced free of cost to the council. The process consists of the substitution of fine carbon for lime, both in the precipitation and sludge pressing; the carbon used is obtained by submitting the sludge cake to a process of destructive distillation. The effluent from the settling tanks resulting from this process will not contain an excess of lime, the deposition of which in distributing mains and on the filters will be obviated.

It is hoped that the process will be in full working order about the middle of July.—From the *Journal* of the Royal Sanitary Institute.

Royal Institute of Public Health.—The annual congress of this body will be held in Edinburgh from July 15th-20th inclusive.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to the Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for June is awarded to

Mr. H. G. Lewis,
Admiralty House,
Crombie,
Near Dunfermline, Fife.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

Mr. Ernest Lovett, of Stoke-on-Trent, has selected the following books in respect of the premium for May:—

"Sewerage Systems, their Design and Construction," by Hugh S. Watson (Lockwood).

"Water Engineering," by Chas. Slagg (Lockwood).

"The Precise Calculation of Pipe Drain and Sewer Dimensions," by C. E. Howsden (Longmans).

These have been duly sent to him.

QUESTIONS.

This week answers are invited to the following questions:—

404. Collapsing Strength of Pipes.—What is the collapsing pressure in lbs. per square inch of a 3-in. cast-iron pipe, 12 ft. long, and of ¼-in. thickness? Pressure on outside of pipe only. (H. V. A.)

405. Disinfection.—Sketch and describe a form of steam disinfector suitable for use in a town of 30,000 inhabitants.

406. Building Construction.—Sketch a mansard roof, showing timbers; also a dormer window in an ordinary roof. (Junior.)

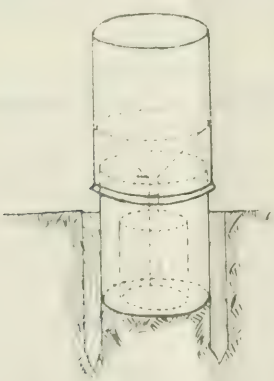
407. Surveying.—Describe a method of setting out circular curves by means of offsets. (M.C.E.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

403. Rain Gauge.—Describe, with sketches, a reliable form of rain gauge.

A reliable form of rain gauge is that known as Glaisher's, and is much used in the British Isles. It is a cylindrical copper vessel, 18 in. high and 8 in. in diameter, in two parts, one fitting on the



other, as shown in sketch. In the upper portion a copper funnel is soldered with its mouth parallel to the top and 8 in. below it. The tube of the funnel reaches nearly to the bottom of a bottle placed under it to receive the rain, and from which the water, if any, is poured daily and measured. The rain gauge is fixed firmly in the ground by means of a wooden frame, with its top 1 ft. above the ground in order to prevent splashes during heavy rain entering the gauge. There is a danger of some raindrops that should be collected being carried away by eddies of air set up by the impact of the wind against the apparatus, and as a precaution an open broad fence, a little higher than the gauge, is sometimes erected round it at a distance of 2 ft. or 3 ft. This, or some other precaution, is very desirable if the gauge is exposed to strong winds or is at an altitude. (Reader.)

408. Pumping.—How many gallons of water per minute will a 7-in. double-acting pump deliver? Stroke 30-in., revolutions 27. Give formula and say how much should be allowed for slip. (A. B.)

Let r = radius of barrel of pump in inches
l = length of stroke " "
n = number of revolutions per minute

Vol. of water delivered per min. by each barrel

$$= \pi r^2 \times l \times n \text{ inches}$$

$$= \frac{\pi r^2 l n}{1728} \text{ c. feet}$$

$$= \frac{\pi r^2 l n \times 6\frac{1}{4}}{1728} \text{ gallons}$$

(Substituting the figures in this example)

$$= \frac{22}{7} \cdot \frac{49}{4} \cdot \frac{30 \cdot 27 \cdot 6\frac{1}{4}}{1728} = 112{\cdot}79 \text{ gallons}$$

Since the pump is double acting, the total vol. delivered per minute is equal to $112{\cdot}79 \times 2 = 225{\cdot}58$ gallons.

It is usual in a pump of this size to allow about 5% off for slip

∴ total vol. delivered per min. = (225·58—11·27)
= 214·31 gallons.

(J. G. W., *Downpatrick.*)

The following is the formula for the delivery of plunger-pumps:—

$$G = D^2 \times 0{\cdot}034 \times L \times N$$

G = gallons pumped per minute
D = diameter of cylinder in inches
L = length of stroke in feet
N = number of strokes per minute.

In the above case the delivery is—

$$G = 7^2 \times 0{\cdot}034 \times 2{\cdot}5 \times 54 = 224{\cdot}9 \text{ gallons per minute.}$$

For plunger pumps a slip of 5 per cent is usually allowed; therefore the correct delivery will be—

$$224{\cdot}9 \times 0{\cdot}95 = 213{\cdot}655 \text{ gallons per minute.}$$

—(H. V. A., *Clapton.*)

Tar-macadam Plant for Somerset.—The county surveyor of Somerset, Mr. E. J. Stead, reported on Tuesday that a length of about 200 yds. of the Bristol and Cheveston road has been laid with tarred limestone macadam, the material being supplied by a local firm. The result was not altogether satisfactory, as the class of stone used is not good, and the methods of manufacture are not sound. As the Road Board were providing four-fifths of the expenditure on this work, regarding it as more or less experimental, it was most important that the utmost endeavour should be used to obtain satisfactory results. There were grave difficulties in ensuring that only the material specified is supplied by manufacturers, and the council agreed that the only satisfactory procedure was to obtain suitable plant and make the tar-macadam by direct labour. Besides ensuring that only the most suitable materials and methods were used, it would be more economical to adopt this course. The sum allowed for this work will permit an area of about 40,000 super. yds. to be surfaced, and in order that the work shall be done in the most approved manner the council adopted the proposition of the county surveyor to purchase a portable plant, comprising stone crusher, dryers, heaters and mixers. The approximate cost is £1,000.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Blackpool T.C. (June 18th. Major J. Stewart). £4,816 for works of private street improvement. The borough surveyor, Mr. J. S. Brodie, explained that the work was to be done by contract, but that no tenders had as yet been accepted. The footpaths were rather wider than usual—9 ft. but it was necessary to have them so in Blackpool. Mr. Brodie gave particulars of the work. He said that if anything the price of materials was going down. The inspector: I am glad to hear something is going down, for there's very little doing so. In the course of the proceedings the inspector thanked the borough surveyor for the careful way in which he had prepared the plans. It was not often, he said, that they got them quite so complete.

Bradford T.C. (June 18th. Mr. W. O. E. Meadekraft). £615 for the purchase of land for the Bierley-lane recreation ground, and sums amounting to £6,780 for the provision of a branch library and cottage baths in Tennyson-place.—The city surveyor, Mr. W. H. S. Dawson, stated that the ground it was proposed to acquire at Bierley-lane had an area of about 3 acres. The town clerk said that the baths and library scheme in Tennyson-place was to replace the Otley-road library, where the premises were very inconvenient.

Cork T.C. (June 18th. Mr. P. C. Cowan).—£2,250 for the purpose of providing additional machinery at the waterworks.—The city engineer stated that a portion of the plant was very old and obsolete. It had been down for fifty-six years, and it was not working as efficiently as it might, and as compared with modern turbines its power and utility were three times less.

Dudley T.C. (June 23rd. Mr. Edgar Dudley).—£3,280 for the purchase of property for the widening of New-street, Hall-street and Castle-street.—New-street was described as a main thoroughfare whose widening was essential. With respect to the purchase of property in Hall-street, the inspector declared that £70 a square yard for the frontage only was too high a price.

Harrogate T.C. (June 10th. Mr. F. H. Tulloch). —£2,096 for private street improvements in West-street, Tors-street, Roseville-road, Anchor-street, Omega-street, Back Omega-street, and back road of Diamond-place.—The necessary evidence was submitted by the borough surveyor, Mr. C. E. Rivers.

Hendon U.D.C. (June 15th. Mr. F. H. Tulloch). —£5,234 for works of private street improvement in Woodville-road, St. Mary's-road and West Heath-road, Golders Green.—The engineer, Mr. S. S. Grimley, stated that it was proposed to use for the pavements artificial stone with red brick for the verges. This was a little cheaper than laying the whole with artificial stone, and the red brick looked better than the gravel, which often got dirty.

Honley U.D.C. (June 16th. Major J. Stewart).—£2,500 for the erection of council offices and gas offices in Eastgate, also a loan of £800 for the widening of Honley Bridge.—The new council offices are to be erected in Eastgate, on a site adjacent to Honley Bridge, and the building will comprise—on the basement floor, workshop, apparatus room, &c.; ground floor, collector's and clerks' offices; vestibule, gas showroom, gas office, &c.; and first floor, council chamber (31 ft. by 19 ft.), committee-room (18 ft. by 17 ft.), surveyor's office, sanitary inspector's office, gas manager's office, laboratory, &c. The walls will be of local stone, lined with bricks, and ashlar dressings, the basement floor to be of concrete. The building will be lighted by electricity, and heated by hot water on the low-pressure system. The proposed improvement comprises the widening of the bridge from Huddersfield-road to Eastgate. The bridge is 24½ ft. wide, and the total width when completed will be 36 ft., consisting of 30-ft. carriageway and 6-ft. footpath. It is intended to pull down and re-erect the parapet wall in a new position. The new portion of the roadway and causeway will be carried by steel channeling. The existing level of the roadway is to be retained throughout.

Millom U.D.C. (June 25th. Major C. E. Norton). £2,250 for the purpose of purchasing Knott End Farm, adjacent to the council's reservoir at Whicham.—The object of the proposed purchase, it was explained, was to remove any possible source of contamination to the water supply.

Rainford U.D.C. (June 26th. Mr. W. H. Collin). £2,500 for the erection of fourteen workmen's dwellings.—It was stated that land for the houses had been offered for 1s. 2½d. per square yard, which was considered a most reasonable price, and Mr. Baron, St. Helens, the architect who had prepared the plans, said the cottages could be erected at a cost of £150 each.

St. Germans U.D.C. (June 23rd. Mr. P. M. Crosthwaites). £1,500 for works of water supply. The surveyor, Mr. P. B. Govett, explained that the proposed works comprise sinking a well, cutting an adit, constructing a reservoir with a capacity of 44,000 gallons, and piping the water for a distance of 3,767 yds. in 3-in. cast-iron mains. The daily yield of water is estimated at 8,000 gallons, and the scheme was intended to serve a population of about 420, whose consumption per head was put down at 10 gallons per day. The inspector, having regard to the fact that insufficient protection seemed to be afforded by the geological formation of the site, suggested the advisability of fencing the collecting area to prevent risk of pollution from the surface.

Sutton Coldfield T.C. (June 24th. Mr. H. Shelford Bidwell).—£5,500 for the provision of a refuse destructor at the rear of the highways depot in Rilandroad.—The borough surveyor, Mr. W. A. H. Clarry, spoke in favour of the site, and explained that the steam generated in the destructor would be utilised in the adjoining electrical works for day load purposes.

Valley (Anglesey) R.D.C. (June 17th. Mr. Edward Leonards). £236 for the purpose of erecting two working men's cottages on a site given by Sir Harry Verney on a 99 years' lease at an annual ground rent of 1s.—It was stated that the scheme (which was formulated by Mr. St. John Hancock on behalf of the Welsh Housing Association) was in the nature of an experiment. Each cottage would contain a large living room, three bedrooms, a scullery, an emergency room, and a pantry, and there would also be a small garden for cultivation. The area of the site was ½ acre. The council proposed to charge a weekly rent of 2s., excluding rates, evidence being given that the rents of cottages at present varied from 1s. to 1s. 6d a week, but these were practically one-room cottages with no conveniences.

APPLICATIONS FOR LOANS.

Aspatria U.D.C. £1,450, additional cost of sewerage scheme.

Colwyn Bay U.D.C.—£1,000 for gas mains.

Evesham R.D.C.—£3,370 for a housing scheme at Bretforton.

Hayfield R.D.C.—£250 for experimental boring works.

Hendon U.D.C.—£4,030 for road widening.

Lewisham B.C.—£1,545 for wood paving works.

Prestatyn U.D.C.—£2,800 for the extension of the waterworks, and £1,110 for road widening.

Shrewsbury T.C.—£2,200 for cemetery extension.

Smethwick T.C.—£2,620 for the purchase of a site for a secondary school.

Truro T.C.—£10,000 for an electric lighting scheme.

Whittlesey R.D.C.—£2,634 for a housing scheme.

LOANS SANCTIONED.

Barking U.D.C. £2,628 for wood paving works.

Castleford U.D.C. £1,724 for laying granite setts.

East Cowes U.D.C.—£600 for street and sewerage works.

Finchley U.D.C.—£6,820 for a public swimming bath.

Hendon U.D.C.—£17,466 for the erection of the Wessex-gardens school, £2,000 for a public convenience, £754 for the purchase of a site at Hale Grove-gardens for a school, £2,110 for street improvement, and £3,500 for sewerage.

Mansfield T.C. £1,600 for works of sewerage.

Nuneaton T.C.—£7,000 for electricity mains and services, and £820 for the provision of a park.

Stoke T.C.—£7,677 for a town hall.

Sunderland R.D.C.—£2,600 for sewerage works.

Swindon T.C.—£4,650 for engineering laboratories at the technical school.

Upton R.D.C. £1,000 further loan for the Kempsey sewerage scheme.

Wirral R.D.C. £2,200 for making up certain streets.

FORTHCOMING INQUIRIES.

JULY.	£
7. **Bolton-upon-Dearne.** For works of sewage disposal (Mr. W. M. Cross)	500
7. **Harwich.** For the provision of public playgrounds (Mr. Edgar Dudley)	400
7. **Holmfirth.** For works of water supply (Major C. E. Norton)	6,800
7.—**Nottingham.** For the purposes of public baths (Mr. F. H. Tulloch)	1,000
7. **Sheffield.** For the erection of working-class dwellings (Mr. F. O. Stanford)	10,400
7.—**Tavistock.** For works of sewage disposal (Mr. H. Shelford Bidwell)	900
8. **Arnold.** For street improvement (Mr. F. H. Tulloch)	2,500
8. **Barnoldswick.** For the purpose of gas-works (Mr. H. R. Hooper) ...	1,110
8.—**Bosmere.** For the provision of working-class dwellings (Mr. H. S. Stewart) ...	1,300
8.—**Heckmondwike.** For works of water supply (Major C. E. Norton)	320
8.—**Middleton.** For works of sewerage (Mr. F. O. Stanford) . .	1,185
8.—**Rawtenstall.** For the provision of a refuse tip (Mr. Edgar Dudley)	465
8.—**Warminster.** For the provision of working-class dwellings (Mr. H. S. Bidwell)	2,000
8.—**West Bridgford.** For public offices and the provision of a motor omnibus (Mr. W. M. Cross) ...	3,000
9.—**Bath.** For the purposes of sewage disposal (Mr. H. Shelford Bidwell) ...	3,000
9.—**Barrow.** For the provision of an underground convenience (Mr. H. R. Hooper)	650
9.—**Drayton.** For works of sewage disposal (Mr. F. O. Stanford)	—
9.—**Leicester.** For the provision of public conveniences (Mr. W. M. Cross) ..	630
10.—**Lye.** For the purposes of stables, public conveniences, and a recreation ground (Mr. F. O. Stanford)	2,650
10.—**Warrington.** For works of road widening (Mr. Edgar Dudley)	1,410
10.—**Workington.** For the purposes of the gas undertaking (Mr. H. R. Hooper) ...	25,000
14.—**Orsett.** For hospital extension (Dr. F. Seymour) . .	1,114
TOWN PLANNING.	
14.—**Kingston-upon-Hull.** (Mr. George L. Pepler)	—
21. **Grays Thurrock.** (Mr. Thomas Adams)	—

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.
—MASSINGER: "The Fatal Dowry," Act ii., 2.

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR, I had no intention of replying to any further letters of your correspondent "Not so Dusty," but in any case I wish to satisfy you that the statements made in my last letter are not devoid of truth as "Not so Dusty" suggests, and if he will place in your hands the sum of £25, to be devoted to any charity you may decide, I am perfectly willing to prove what he asks—viz., "that I have had thirty years' personal experience in refining bitumen for road paving," and that I "have anything else but a very limited knowledge of the manipulation of natural bitumen for road work outside the laboratory." The evidence and proof would be laid before you, and perhaps you would have no objection to making known, through the columns of your paper, whether I have satisfactorily established my case or not. When this has been done I think I may rightly ask for some form of acknowledgment from your correspondent.—Yours, &c.,

ENGINEER.

INDIAN AND EURASIAN STUDENTS IN ENGLAND.

To the Editor of THE SURVEYOR.

SIR, In reply to the query in THE SURVEYOR of June 26th (p. 1024), I would like to point out that India is a country in making great and rapid strides in sanitation, and that the Indians, Anglo-Indians and Eurasians who have taken to civil engineering as a profession find it to their advantage to come to England to learn sanitary science and pass examinations in civil and sanitary engineering, which make them better fitted for their professions. As to the Government of India defraying the expenses incurred by the students coming to England, this is not the case. Certain students with scholarships in colleges which help them pecuniarily, and the vast majority come at their own expense with the object in view of perfecting themselves in their profession. If the same facilities were provided for the students to gain the required experience and get the necessary testamurs in India, there would not be the influx of Indian, Anglo-Indian and Eurasian students in England that there is at the present time.—Yours, &c.,

AN ANGLO-INDIAN
(Student Engineer).

July 1, 1914.

THE UPKEEP OF ROADS.

MOTOR 'BUS OWNERS' CONTRIBUTIONS.

The Local Legislation Committee of the House of Commons on Wednesday had before it the question of motor 'bus owners' contributions towards the upkeep of roads.

Sheffield Corporation sought powers to run motor omnibus services over seven different routes, extending outside the city boundaries into the area of the West Riding County Council and the Derbyshire County Council. These authorities opposed the Bill, and urged that the powers sought should not be granted unless Sheffield were put under an obligation to contribute towards the upkeep of the country roads for extra wear and tear due to the motor 'bus traffic.

The Committee decided to authorise four of the seven routes proposed, on condition that Sheffield contributed towards the upkeep of the roads at the rate of ¾d. for each car-mile run by the motor 'buses, the contribution to be subject to revision every three years. In the event of the Imperial contribution to main roads being increased by one-fourth of the total outlay, Sheffield's contribution is to be reduced by one-half, and in the event of the Government paying half the cost of main roads Sheffield's contribution will cease.

The Chairman said the Committee, in their annual report, would suggest that Parliament should lay down a general principle to apply to the whole country.

Answering a question in the House on Wednesday, the President of the Local Government Board said it was proposed to ask Parliament to appoint a Joint Select Committee to consider the general question of contributions to road expenses by the owners of motor and trolley omnibus services. The question of requiring the owners of heavy motor vehicles to pay a larger contribution than now was receiving the attention of the Treasury. He hoped it might be possible to begin the investigation this Session.

The Salford Highways Committee.—The Salford Highways Committee, whose action with respect to street maintenance in the borough has been condemned by a special committee, have resigned in a body as a protest against the continued refusal of the town council to sanction a higher rate for the purposes of the department.

The New Western Road Scheme.—Considerable opposition will be offered to the new Western road proposal of the Middlesex County Council when it comes before the House of Lords Committee in a few days. The Metropolitan Water Board, the London United Tramways, the Duke of Northumberland, the Metropolitan District Railway Company, the London General Omnibus Company, the Roads Improvement Association, and the Brentford Gas Company, have lodged petitions praying to be heard in Committee against it.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Birkenhead £12,000, Kidderminster £8,000; housing and town planning—Cambridge, Doncaster; roads and materials—Bexhill, Hammersmith £3,550; sewerage and sewage disposal—Burry Port, Wrexham; water, gas and electricity—Haddingtonshire. Particulars of other projected works will be found in the "Local Government Board Inquiries" pages.

BUILDINGS.

Bexhill T.C.—The borough surveyor, Mr. T. Ball, has received instructions to prepare a plan and estimate for the provision of a chalet or pavilion for catering purposes in the public park.

Birkenhead T.C.—A scheme has been adopted for extensions to the borough hospital, at an estimated cost of £12,000.

Brighton T.C.—It has been agreed to provide an infants' department at the Coombe-road school at a cost of £6,317. A scheme has also been adopted for a lairage at the abattoir, at an estimated cost of £280.

Essex C.C.—The council have decided to build a secondary school for 200 scholars at Barking.

Kidderminster T.C.—The Baths Committee recommend a scheme for new baths, at an estimated cost of £8,000.

Stoke Newington B.C.—A scheme has been adopted for the extension of the municipal offices, at an estimated cost of £1,550.

Upholland U.D.C.—The council have adopted the estimate of cost, at £1,800, prepared by the surveyor, Mr. A. Hunt, for the erection of new municipal offices.

HOUSING AND TOWN PLANNING.

Alnwick U.D.C.—It has been agreed to build eighteen workmen's houses in South-road.

Barry U.D.C.—A scheme has been passed for building twenty-four workmen's houses at £200 each.

Cambridge T.C.—A resolution has been passed to build 150 houses at rentals under £15 yearly, including rates.

Doncaster T.C.—A scheme has been approved for the erection of 100 workmen's houses on a portion of the Carr House estate.

Glasgow T.C.—It has been agreed to build two balcony tenements of three storeys in height facing Moncur-street, and so planned that the houses may be let separately as forty-eight single apartments, or if desired, as two-apartment dwellings. The following is the estimated cost of the tenements and caretaker's house: Cost of site (1,050 sq. yds.), £1,365; cost of building, £3,500; cost of furnishings, £310; total, £5,175. The estimated annual revenue and expenditure are as follows: Revenue—forty-eight apartments let at an average of 4s. 6d. per week, £561 12s.; expenditure, £553 15s.; leaving a surplus of £7 17s.

Holywell R.D.C.—Subject to certain slight alterations, Lord Mostyn has given his approval of the council's plans for the erection of workmen's dwellings at Mostyn. Owing to the lack of an adequate water supply, it had been decided to eliminate from the plans the provision of baths. The chairman of the Housing Committee, Mr. J. Petrie, explained that this water difficulty prevailed in every district where the council was proposing to erect workmen's dwellings. They all agreed as to the desirability of providing baths in these houses, but it was useless to go to the expense of doing so when there was not a sufficient supply of water.

Northwich U.D.C.—The surveyor, Mr. J. Brooke, has been instructed to prepare specifications and obtain tenders for the erection of thirty-six workmen's dwellings.

PARKS AND OPEN SPACES.

Chester T.C.—Having acquired the grounds of the old Deeside Tennis Club, the Meadows, the council have resolved to lay out two tennis courts and a bowling green for the use of the public.

ROADS AND MATERIALS.

Bexhill T.C. With reference to the proposed coastal road, the borough surveyor, Mr. T. Ball, reported on Monday that he had received from the borough surveyor of Eastbourne, Mr. A. E. Prescott, a letter, in which it was suggested that an estimate of the cost of the whole of the works should be prepared by the surveyor of each local authority through whose area the road would pass. He had therefore prepared a preliminary estimate, and submitted it to the Highways Committee. The estimate was for £64,566, and the committee approved of its being submitted for consideration at the next conference of the authorities interested.

Chelmsford T.C.—The Road Board have sanctioned a grant of £2,139 for resurfacing the main roads during the current financial year, subject to a satisfactory scheme being agreed upon.

Chester T.C.—Application is to be made to the Road Board for a grant of £500 for proposed improvements in Northgate-street.

Haddingtonshire C.C.—The council have authorised capital expenditure of £12,493 in respect of the Eastern District, and £18,237 in respect of the Western District for the purchase of additional plant in connection with an extensive scheme of road improvement which has been resolved upon. Towards the cost the Road Board have sanctioned a grant of £8,123. In terms of the arrangement made, authority has been given to borrow £18,500, free of interest, from the Road Development Commissioners.

Hammersmith B.C.—Wood paving works, estimated to cost £3,550, are to be carried out at Walling-road.

Hornsey T.C.—The chairman of the Highways and Lighting Committee announced at a meeting recently that owing largely to the perseverance of the borough engineer and surveyor, Mr. E. J. Lovegrove, the council had a promise of £3,000 from the Road Board for the roads.

Lambeth B.C.—A report has been submitted by the borough engineer, Mr. H. C. J. Edwards, giving details of the work of cleansing the roadways and the number of men employed, and concluding with the suggestion that eighteen men might be dispensed with. It was recommended that the sweeping gangs be reduced by eighteen men. Councillor Hawes thought that machine sweepers (motors) and mechanical traction ought to be adopted as being more economical and up-to-date. Eventually it was agreed that the borough engineer should ascertain how many men had been discharged owing to the adoption of tar-spraying by other London boroughs, in order to ascertain what economy had been effected.

Llanfrechfa U.D.C.—A number of roads have been scheduled in order to be dealt with under the Private Street Works Act.

Louth R.D.C.—A steam roller with accessories is to be purchased from Messrs. Marshall, Sons & Co., Gainsborough, for £545.

Scarborough T.C.—The borough surveyor, Mr. H. W. Smith, has prepared plans of a proposed new road from Castle-road to St. Mary's-walk, which are being considered by the Streets and Works Sub-committee.

Stoke Newington B.C.—Repairs are to be carried out in Finsbury Park-road, at an estimated cost of £377.

SEWERAGE AND SEWAGE DISPOSAL.

Burry Port U.D.C.—Mr. H. B. Cottrell, of Bristol, has been appointed to report on and superintend the carrying out of a scheme for the drainage and sewerage of the district.

Hendon U.D.C.—Negotiations have been completed for the purchase of land for a scheme of sewage disposal.

Newport (Mon.) T.C. — The Health Committee recommend the acceptance of the tender of Mr. Ewart Evans, at £9,821, for the construction of sewers and outfall works.

Rochford (Essex) R.D.C.—The Local Government Board have expressed approval generally of the pro-

[illegible] will be [illegible] an estimated [illegible] £2,000.

Wombwell U.D.C.—[illegible] Mr. W. Quest [illegible] prepare [illegible] and estimates [illegible] of the sewage disposal [illegible].

Wrotham U.D.C.—The plans of the proposed new [illegible] are [illegible] and will be submitted [illegible] the Local Government Board.

WATER, GAS, AND ELECTRICITY.

Bedford R.D.C.—It has been decided to engage an [illegible] at a fee of 20 guineas to report upon schemes for a water supply to the parishes of Great Barford, Roxton, Wilden, Ravensden, Clapham, and the Hundred parishes of Goldington.

Belfast T.C.—The tender of the British Westinghouse Electric and Manufacturing Company, Limited, at £2,000 has been accepted for the supply of a rotary converter for the electricity works.

Brighton T.C.—The nett surplus on the working of the electricity undertaking last year was £2,342, as against £1,197 in the previous year.

Haddingtonshire C.C.—Capital expenditure of £3,380 has been sanctioned for work in connection with the North Berwick special water supply district.

Matlock Bath U.D.C.—Mr. G. Key, vice-chairman of the council, has presented to the town a recently discovered source of water supply, which, it is calculated, will save a rate of 2d. in the £. A curious history attaches to the place where the water is to be tapped. A century ago a Manchester man sunk £20,000 in lead mine workings there, and struck a large spring, which flooded him out, and he lost all his capital.

Paignton U.D.C.—The water engineer reports that since scraping was first started this year the delivery of the main has apparently been increased 25 per cent. The council decided to obtain an estimate for a new scraper, and approved the recommendation of the water engineer with regard to the renewal of the old water main.

Southmolton R.D.C.—The medical officer, Dr. Sydenham, in his report, warns the council that the Northmolton water supply should receive attention this year, and that at Witheridge it would also be necessary to do something.

Tanderagee R.D.C.—The Local Government Board having directed the council to provide a proper water supply for the Laurelvale district, the council have engaged the services of Mr. Ross, of Messrs. Perry & Ross, to report on the best means of improving the supply.

Upton R.D.C.—The Local Government Board have sanctioned the scheme for a water supply at Upton, and has also given consent to a loan to the extent of the council's borrowing powers.

Woolwich B.C.—The Board of Trade have sanctioned an arrangement by which the Woolwich municipal electricity undertaking proposes to join two private company concerns in the matter of bulk supply. Such an arrangement between a municipality and private companies has not previously been sanctioned in connection with any Metropolitan electricity undertaking.

MISCELLANEOUS.

Bolton T.C.—The borough surveyor, Mr. E. L. Morgan, has submitted an estimate in connection with the proposed purchase of land for the extension of the cemetery, and the Finance Committee have been authorised to apply to the Local Government Board for sanction to borrow £4,701 for the purpose.

Liverpool T.C.—The corporation have just ordered eight Halley tipping waggons. This is the eighth order received by the Halley Company from the same source in four years.

Middlesex C.C.—The council have intimated to the Thames Conservancy that, in view of the expense involved, estimated at £5,000, and the fact that the [illegible] of the Thames would be to a large extent [illegible] the scheme of the Conservancy's engineer for the prevention of flooding.—The Road Board has agreed to contribute, subject to the consent of the Treasury, one-third of the total estimated cost (£371,071) of some thirty-seven schemes [illegible] main and district roads in the county. Included are the Kingston-road, Teddington, which is to be resurfaced with bituminous mate-

rial at a cost of £2,470; the Kingston and Staines main road, Sunbury, to be resurfaced with Tarmac at a cost of £2,767; and the Staines main road, to be laid with asphalt pavement at a cost of £36,646. Subject to the Hampton Urban District Council giving up the necessary land, it has been agreed that the county engineer (Mr. H. T. Wakelam) should be instructed to widen the Upper Sunbury-road opposite the district council offices at an estimated cost of £200. The tender of Messrs. Stephen Kavanagh & Co., of Surbiton-hill, has been accepted at £8,655, for the rebuilding of Cranford county bridge. As a preliminary to the preparation of a report as to the possibility of widening Richmond Bridge and improving the Surrey side approach thereto, while retaining the artistic beauty of the bridge, it has been agreed, on the recommendation of the surveyors to the two county councils concerned, to spend about £700 for putting down test pits for the purpose of making a close examination of the foundations of the bridge, provided the Surrey County Council agree to pay half the cost.

PERSONAL.

Mr. Arthur Oddy, borough surveyor of Yeovil, has received an increase of salary of £25 a year.

Mr. W. F. Gardner, assistant in the borough surveyor's department, Morecambe, has been appointed assistant to Mr. J. E. Aldersley, surveyor to the Earby Urban District Council.

Mr. H. W. Carter, surveyor and inspector of Matlock Bath, has been appointed surveyor and sanitary inspector to the Bollington Urban District Council, at a salary of £140 per annum.

Mr. H. T. Wakelam, M.INST.C.E., county engineer of Middlesex, on Thursday of last week had his salary increased to £1,600 a year (to advance to £1,800), increase to date from April 1, 1914.

Mr. J. A. Brodie, city engineer of Liverpool, will read a paper at the annual meeting of the Tramways and Light Railways Association, which is to be held at Newcastle-on-Tyne on July 16th and 17th.

Mr. A. H. Clayton, surveyor to the Deeside District Committee of the County of Aberdeen, has received an increase of salary of £50 per annum. Since Mr. Clayton's appointment six years ago, his committee have shown their appreciation of his services in many ways, more notably in the purchase of a residence for him, and the purchase of a motor car to enable him the better to supervise the work of his large district.

Mr. Albert D. Jenkins is recommended by a subcommitttee of the Liverpool Corporation for the office of city land steward and surveyor, vacant by the retirement of Mr. Shelmerdine, at a commencing salary of £1,200 a year. Mr. Jenkins is forty-two years of age, and is a Fellow of the Surveyors' Institution, a member of the Auctioneers' and Estate Agents' Institution, and of the Royal Sanitary Institute. Formerly in private practice in Swansea, he has had considerable experience of estate development, building and management, and has charge of large transactions in all classes of property. For the past three years he has successfully managed the Swansea Corporation buildings and landed estate, the latter comprising over 1,000 acres, with a rental of about £18,000 a year, besides 645 acres belonging to the Education Committee. He has advised the corporation in respect to a development scheme for the Town Hill estate, eventually to cost over £300,000 plus a tramway scheme to cost about £50,000, and various housing and drainage projects.

The assumption in last week's issue, based upon the report in a local paper, that the silver challenge cup for rowing which was competed for recently was the gift of the present surveyor to the Wood Green Urban Council, Mr. C. H. Croxford, and the clerk, turns out to be incorrect, as the trophy was given jointly by a former surveyor and clerk.

Obituary.—We regret to announce the death, which occurred on Sunday last, of Mr. J. Campbell Smith, formerly borough surveyor of Bury St. Edmunds. Deceased was fifty-eight years of age. The funeral, which took place on Wednesday, was attended by Mr. A. Mitchell, the deputy mayor of Bury St. Edmunds, and Mr. W. D. Harding, the borough surveyor, among others.

FOR OTHER ADVERTISEMENTS

See End of Paper.

COUNTY OF SOUTHAMPTON.

RECONSTRUCTION OF STONING BRIDGE, RINGWOOD.

Persons desirous of tendering for the partial reconstruction of Stoning Bridge, situated at Ringwood, may obtain copies of the Plan, Specification and General Conditions, and all other necessary information, on application at the office of Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on and after Wednesday, July 8th, 1914, between the hours of 9 a.m. and 4.30 p.m. (Saturdays 9 a.m. and 12.30 p.m.).

A deposit of two guineas will be required for a copy of the Plan and Specification and General Conditions. The deposit will be refunded on receipt of a *bonâ-fide* Tender and the return of the documents. Deposit must be made by cheque payable to the Hampshire County Council, and crossed "Capital and Counties Bank, Ltd., Winchester," or the particulars cannot be sent.

Tenders must be on forms supplied by the County Surveyor, endorsed "Stoning Bridge, Ringwood," and be delivered to me on or before 10 a.m. on Monday, the 20th July, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

H. BARBER.
Clerk of the County Council.

The Castle,
Winchester.
June 30, 1914. (1,754)

COUNTY OF SOUTHAMPTON.

RECONSTRUCTION AND STRENGTHENING OF ST. CROSS BRIDGES, NEAR WINCHESTER.

Persons desirous of tendering for the Reconstruction and Strengthening of Four Small Bridges, situated on the Winchester and Botley Main Road, just south of St. Cross, near Winchester, may obtain copies of the Plan and Specification, General Conditions, and all other necessary information on application at the office of Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, between the hours of 9 a.m. and 4.30 p.m. (Saturdays, 9 a.m. and 12.30 p.m.).

A deposit of one guinea will be required for a copy of the Plan and Specification, General Conditions, which will be refunded on receipt of a *bonâ-fide* tender and the return of the documents.

Deposits must be made by cheque, payable to the "Hampshire County Council," and crossed "Capital and Counties Bank, Limited, Winchester," or the particulars cannot be sent.

Tenders must be on forms supplied by the County Surveyor, endorsed "St. Cross Bridges," and be delivered to me on or before 10 a.m. on Monday, the 20th July, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

H. BARBER,
Clerk of the County Council.

The Castle, Winchester.
June 29, 1914. (1,753)

URBAN DISTRICT OF DENTON.

The Urban District Council of Denton invite Tenders for the Construction of about One Thousand Yards of Twelve-inch Stoneware Pipe Sewer, partly in Tunnel, and other works in connection therewith in Thornley-lane and Gorton-road, Denton.

Drawings may be seen at the office of the Clerk of Works in Thornley-lane, Denton.

Specifications and Forms of Tender may be obtained at the office of the Surveyor to the Council, Town Hall, Denton, near Manchester, between 9.30 o'clock and 11.30 o'clock in the morning of any weekday on payment of One Guinea, which will be refunded upon the receipt by the Council of a *bonâ-fide* Tender in each case.

Tenders to be enclosed in a sealed envelope, and endorsed "Tender for Thornley-lane Sewer," and addressed to the Chairman of the Sewage Committee, Town Hall, Denton, near Manchester, and sent in so as to be delivered not later than Wednesday, the 22nd July, 1914.

(By order)
WM. RICHARDS,
Clerk to the Council.

Town Hall,
Denton.
July 1, 1914. (1,756)

TOTTENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Council invite Tenders for Making Up South-grove (Sec. 1, part of).

The plans can be seen, and Forms of Tender and other particulars can be obtained, on application to Mr. W. H. Prescott, M.INST.C.E., Town Hall, Tottenham.

The sum of £5 will be charged for the Quantities in respect of the Road, which sum will be forfeited by the person whose Tender is accepted if the Contract be not executed within seven days from the date he is informed it is ready for signature, otherwise it will be repaid.

Provided that *bonâ-fide* Tenders are received, accompanied by the Conditions, Specification, and Quantities, the deposit will be returned to the unsuccessful parties and their Quantities returned.

The Contractor will be required to pay all workmen on the Council's work the recognised Trade Union rate of wages. A schedule of such wages will be inserted in the Contract, and a copy of the schedule must be exhibited on the pay office at the works.

Sealed Tenders, on the Form supplied, endorsed "Tender for Making Up South-grove (Sec. 1, part of)," to be delivered to me by twelve o'clock noon on Tuesday, 14th July, 1914.

No other Form of Tender will be received.

Security will be required for the due performance of the Contract.

The Council will not be bound to accept the lowest or any Tender, and reserve the right to accept a part only of any Tender received.

(By order)
E. CROWNE,
Clerk of the Council.

Tottenham.
June 30, 1914. (1,760)

BAKEWELL RURAL DISTRICT COUNCIL.

NORTH AND SOUTH DISTRICTS.
TO STEAM ROLLER PROPRIETORS.

Tenders are invited for the Hiring of Two Steam Rollers, with Scarifiers, for approximately six months each.

Particulars can be obtained from Mr. M. Mann, Surveyor, North District, Foolow, near Sheffield, or the undersigned.

Tenders, endorsed "Tender for Steam Rolling," to be addressed and delivered to the undersigned on or before Friday, 17th July, 1914.

The lowest or any Tender will not necessarily be accepted.

T. W. MAWER,
Surveyor (South District).

Surveyor's Department,
Youlgrave,
Bakewell.
July 1, 1914. (1,755)

BOROUGH OF BLANDFORD.

TAR-SPRAYING.

The Corporation of the above Borough are prepared to receive Tenders for Tar-spraying 20,000 sq. yds., more or less, of their Road Surfaces.

Specification and particulars can be obtained from the Borough Surveyor, Mr. P. C. Woodhall.

Tenders, endorsed "Tender for Tar-spraying," to be delivered to the Chairman of the Highways Committee, Mr. Alderman Ball, West-street, Blandford, on or before 5 o'clock p.m., Monday, July 13, 1914.

The lowest or any Tender not necessarily accepted.

C. W. SYMES,
(1,752) Town Clerk.

SURVEYING ASSISTANT. — Wanted in a Borough Surveyor's Office in the Manchester District, a Surveying Assistant well experienced in Private Street Work, quick and accurate, and a good draughtsman. Salary, £2 2s. per week. Applications, stating age, particulars of training and experience, and accompanied by copies of not more than three recent testimonials, to be delivered to Box 1,439, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C., on or before Friday, the 10th inst. (1,757)

ASSISTANT (22), Stud.Inst.C.E., A.M.I.C.E. Exam. (parts), seeks position. Moderate salary. 4 years' office and clerk of works' experience under consulting engineer, chiefly on sewerage, sewage disposal and water works. Box 1,440, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,759)

Institution of Water Engineers.

SUMMER GENERAL MEETING AT STOCKPORT.

(Conclusion.)

The business of the special summer meeting of the Institution of Water Engineers at Stockport, presided over by Mr. F. Mallinson, included the consideration of the following paper:

CONTINUOUS AERATION AND FILTRATION OF THE WATER OF PUBLIC SWIMMING BATHS.

By L. Hulme Lewis.

Manchester.

The author was associated, almost from the outset, with three others appointed by the Baths Committee and the Waterworks Committee of the Manchester Corporation to investigate and to determine the best means for extracting the colouring matter from the town water supply in order to make it more suitable for use in the public swimming baths, and as the investigations ultimately led to the adoption of continuous aëration and filtration in the city, he proposes to give an account of the evolution of the process.

The water used for the public swimming baths in Manchester is obtained from the town supply, the greater part of which is collected from moorland watersheds, and is invariably more or less discoloured, the degree of discoloration being subject to considerable variation through changes in the weather, and the varying condition of the vegetation and soils with which it comes in contact in its passage into the impounding reservoirs. The discoloration is generally very pronounced when heavy rainfall follows upon a long spell of dry and sunny weather, and the water usually remains more or less discoloured for a considerable time after the rain ceases. While the colour may not, and usually does not, affect either the potability of the water or its fitness for industrial purposes, it is very objectionable in water used in public swimming baths. . . . The system of continuous aëration and filtration was at first viewed with considerable misgivings by medical officers of health and others interested in the matter, but it has now proved capable of maintaining water, even when continually fouled by body contact, &c., free from all offensive smell, and in a bright, clear and otherwise satisfactory condition for an indefinite period. . . .

In the early part of the year 1901 the Btahs Committee empowered Alderman Rothwell to confer with the Waterworks Committee with respect to the treatment of the town water supply as a whole in order to make it more suitable for use in swimming baths. It must, however, be explained that there was nothing exceptional in the condition of the town water at this period to warrant special investigation, or to make its treatment more necessary than previously. The Waterworks Committee, on being approached on the subject, and influenced no doubt by the economy which would be effected by any successful method of continuous filtration, readily assented to co-operate with the Baths Committee in carrying out certain experiments for the purpose of ascertaining the extent to which the water could be made more transparent by mechanical filtration.

The conduct of the investigations and experiments was left in the hands of Alderman Rothwell, while Mr. Haynes (water engineer), was appointed to co-operate on behalf of the Waterworks Committee, and Mr. Derbyshire (General Superintendent of Baths) on behalf of the Baths Committee. Several firms of filter manufacturers were invited to submit proposals, but after inspecting various processes in operation, and ascertaining that the object in view could not be satisfactorily attained with any of the plants inspected, it was decided to design and construct an experimental filter on lines suggested by Alderman Rothwell. The design of the filter (Plate 1), was prepared by Mr. Haynes. It consisted of a rectangular cast-iron tank having a false bottom A to form a compartment B for the reception of the filtered water. The water from the town main was discharged into the upper compartment C of the tank through a ball-valve D, and passed from this compartment through the filtering medium E into the lower compartment B, and thence into a heater on its way to the bath. The filtering medium was wrapped round wire-woven cylinders F, which were arranged vertically over suitable openings G in the false bottom of the tank.

The filter was fixed in connection with one of the baths at the Newton Heath establishment, and a series of interesting and instructive experiments followed, the results of each change, both in the filtering medium and in the rate of filtration being carefully recorded. Various kinds of filtering materials were tried, including coarse turkish towelling, bath-mats, felts of varying thicknesses and densities, filter-paper, and finally a specially prepared felt cloth, the last-named material proving the most suitable. While a marked improvement in the condition of the water was secured, the discoloration was not completely removed. . . .

It was evident, however, that filtration alone would not be sufficient to restore the water even to its original state of clearness and purity, on account of its having to be maintained at a temperature of about 78 deg. Fahr., and that to maintain its fresh and bright appearance it would require to be thoroughly aërated and reoxygenated. It was accordingly resolved to put down an experimental plant in connection with one of the baths at Newton Heath by which this could be put to the test. On Plate 2 is shown the general arrangement of this plant, designed to circulate the bath-water in such a manner as to subject it to a continuous process of aëration and filtration. Means were provided for regulating the rate of circulation, from a minimum rate that would circulate the contents of the bath once in twenty-four hours, to a maximum rate that would circulate this quantity in six hours. The filter used for the earlier experiments was again utilised, and the aërator was placed immediately over the filter tank. The water was raised from the deep end of the bath to the horizontal pipe A above the aërator by a vertical steam-driven reciprocating pump, the exhaust steam from the pump being utilised for reheating the water in its way back to the bath. Pipe A was perforated from end to end over the upper third of its circumference, as shown in Fig. 2A (Plate 2). The water, as it issued through these perforations, broke into a spray, and on coming into contact with the walls of the open ridge B, rebounded, and was caught as it fell to the upper perforated tray C, in the air currents induced by the water as it issued from pipe A. Further aëration and oxygenisation occurred as the water fell from trays C into the filter D, in which the suspended matter was arrested. The trays were finely perforated in order to thoroughly split up the water. The water was conducted from the filter to a reheater E, and thence to the shallow end of the bath.

The results were highly satisfactory, the water in the bath, which was in regular use, steadily improving in condition and appearance from day to day until it became sufficiently clear to distinctly see a threepenny-bit at the bottom of the deep end of the bath. The process of aëration and filtration was continued, at varying rates, regularly for several months, during which time the normal number of bathers used the bath. The water was examined after being in use for about three months, and was declared to be in even a better condition for bathing purposes than when it was first put into the bath. It is safe to assert that no one expected such good results from such a simple process. It not only gave excellent and equal conditions to all bathers at all times, but showed that substantial economies could be effected in the cost of running public bathing establishments.

When the author was engaged in the preparation of plans for the experimental plant above described it came to his knowledge that Mr. O. M. Row—the first to suggest the idea of aëration—had been actively at work for some time previously in developing a scheme having for its object the purification of the water of swimming baths, and was at that moment in negotiation with the Bury Corporation with reference to the installation of his system at their public swimming bath. The section shown on Plate 3 is an illustration of the first complete and permanent installation for the continuous aëration and filtration of bath water. The system was an unqualified success from the beginning, and quickly established itself in public favour; there are at present over 100 installations in successful operation.

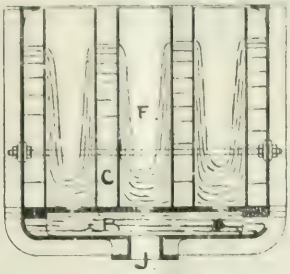
The system of purifying bath water by continuous aëration and filtration provides vastly more pleasant

and hygienic conditions than those which obtain when the same water is used for many days unchanged and unpurified. It also prevents the depressing atmospheric effect that invariably prevails where the system is not in operation.

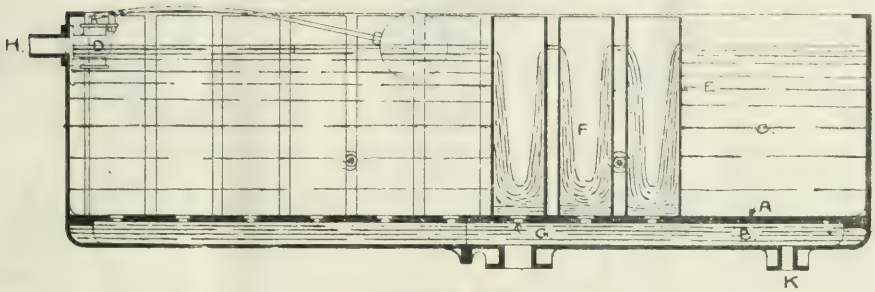
Chemical and bacteriological analyses of samples of water taken from baths after months of use have proved that the water suffers little or no deterioration by prolonged use provided (1) that the purifying plant is correctly proportioned, (2) that the aëration and filtration are continuously maintained, and (3) that the rate of circulation is correctly adjusted to suit the conditions. . . .

The first two complete and permanent plants for the Manchester Corporation were designed by the author, and were installed at the Victoria Baths and the Moss Side Baths respectively. On Plate 4 is shown the general arrangement of the installation at Victoria Baths, where there are three swimming baths, each provided with a separate purifying plant. The plants differ from the experimental plant at Newton Heath only in capacity, and in the design of the aërators and the filters. The aëration was at first accomplished by means of wide shallow channels constructed entirely of wood set perfectly level transversely, and with sufficient fall longitudinally to allow the water to run over them in an even, thin sheet. Each channel was 4 ft. in width and 3 in. in depth, and had a total length of 42 ft. divided into four sections of equal length, with a 6-in. drop at the end of each section. A number of transverse grooves of U shape (shown in Fig. 4v, Plate 4) were cut in the bottom of the channels in order to break up the water as it passed over them. This method gave fairly good results as regards aëration, but proved less effective as a re-oxygeniser than the experimental plant at the Newton Heath establishment, already described. This, therefore, was added later, in an improved form, to the purifying plant at the Victoria Baths. The same type of aërator, but differing in some of the details, has been adopted in connection with all the purifying plants subsequently installed in Manchester, and also in connection with similar plants fixed elsewhere, with few exceptions.

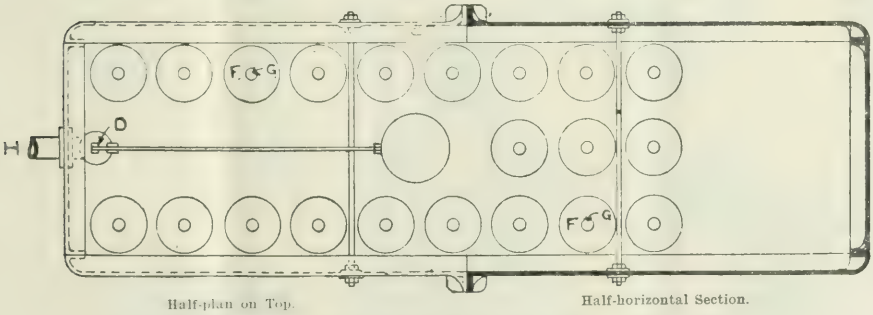
Fig. 5 shows the main features of this aërator. The ends, which form the frame, are of steel or cast iron made in the shape of a triangle. The sides are formed of louvres, suitably pitched and usually made of glass. They are carried on rods capable of being rocked by hand for the purpose of adjusting the width of the openings. These openings form the passages for the escape of vapour which carries away any offensive smell liberated from the water, and for the admission and emission of fresh air. The water from the circulating pump is discharged through a perforated pipe placed over and extending the full length of the aërator. The water falls from the pipe into the top tray, and thence from tray to tray, in the form of a cascade, to the receiving tank at the bottom. The trays, which are usually made of sheet copper or zinc and finely perforated, gradually increase in area from the highest to the lowest in order to prevent waste of water by splashing over the sides and ends. Suitable shields are added if the aërator is placed in a very exposed position, to prevent the spraying water being blown about by the wind.



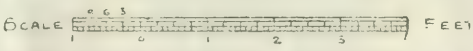
Cross-section.



Longitudinal Section.



Half-plan on Top. Half-horizontal Section.



NEWTON HEATH BATHS, MANCHESTER: DETAIL OF ORIGINAL FILTER.

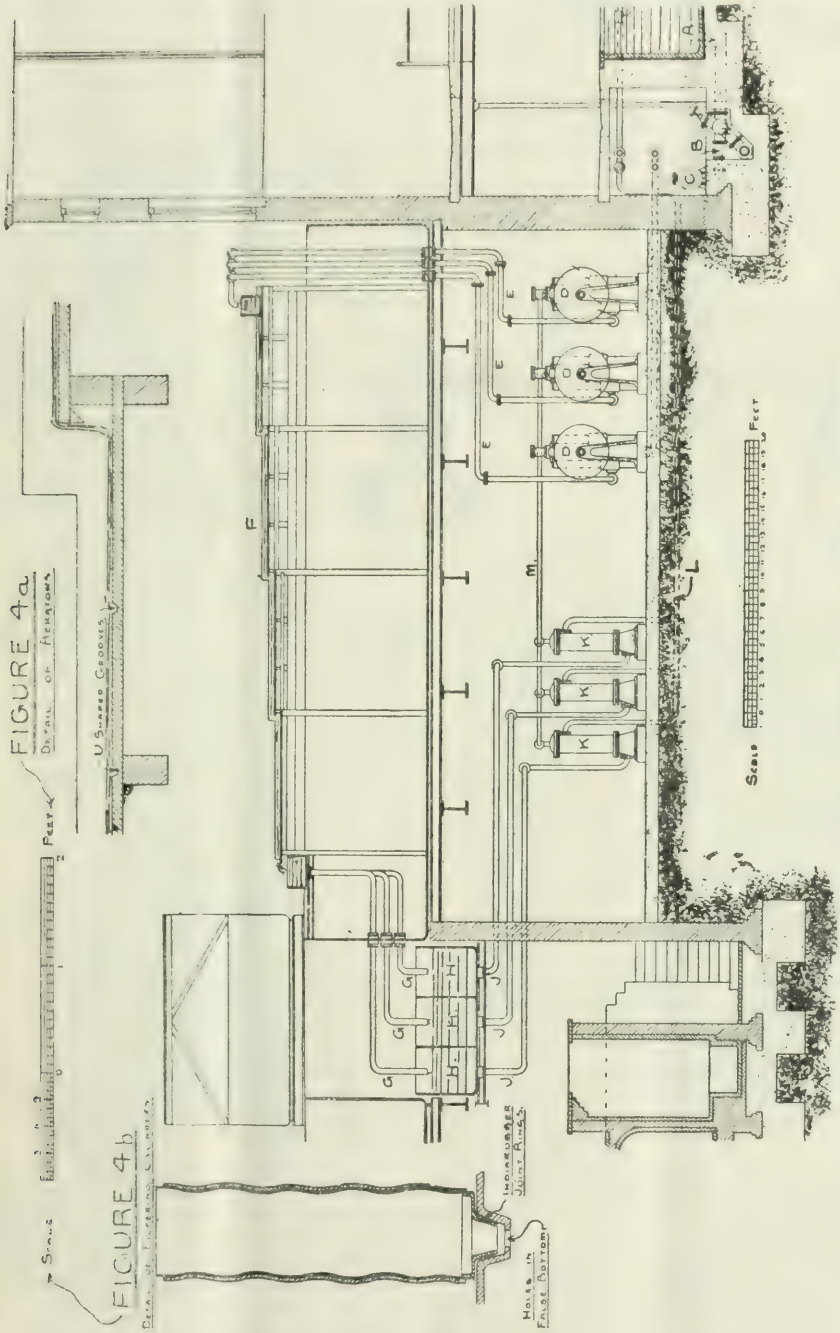
(A—False bottom of tank; B—Lower compartment of tank; C—Upper compartment of tank; D—Ball controlled valve; E—Filtering medium; F—Wire-woven cylinders; G—Openings in false bottom; H—Town water supply pipe; J—Filtered water outlet; K—Washout.)

(Plate 1.)

[illegible] at Victoria Baths [illegible] of [illegible] at Newton Heath, [illegible] and a [illegible] [illegible] [illegible]

to fit tightly on the cylinder. This material gave excellent results, but the amount of manual labour involved in changing and cleaning the cloths was so much that had it be frequently performed was a serious disadvantage, and after some further experiments it was decided to adopt gravel or quartz filters.

Fig. 6 is an illustration of the main features of the filter as made by Victoria Baths. It consists of a closed cylindrical steel casing A, having a perforated false bottom B, consisting of a brass wire mesh sandwiched between two perforated cast-iron plates. The filtering material is fine pearl gravel, which is placed



VICTORIA BATHS, MANCHESTER: GENERAL ARRANGEMENT OF AERATING AND FILTERING PLANT.

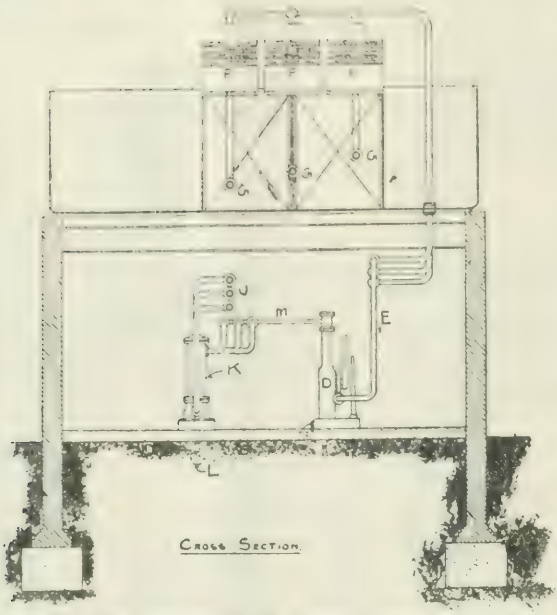
(A—Outlet grids at deep end of baths; B—Connecting pipes to suction of circulating pumps; C—Strainers in line of suction pipes to arrest coarse matter; D—Steam-driven circulating pumps; E—Delivery pipes from pumps to aerators; F—Aerators; G—Connecting pipes from aerators to filters; H—Filters; J—Connecting pipes from filters to reheaters; K—Reheaters; L—Connecting pipes from reheaters to shallow ends of baths; M—Steam exhaust pipes from circulating pumps to reheaters; N—Connecting pipe from deep end of baths to drain.)

(Plate 4.)

on the ground that they could be cleaned without removing any of the parts, and would work efficiently for reasonably long periods with occasional flushing in situ, and therefore would require less attention, would cost less in upkeep, and be generally more suitable.

upon the false bottom. The water to be filtered enters by the valve D, percolates through the gravel bed, passes through the perforations in the false bottom and discharges, clarified, through the valve E. To clean the filtering material the inlet valve D is closed, the waste outlet F, the air cock G, the stop valve H,

[illegible] the drain valve J are open. The [illegible] K, controlling the [illegible] valve J. The [illegible] at



Aerating and Filtering Plant, Victoria Baths, Manchester.

(Plate 4.)

[illegible] through a system of perforated pipes M, the perforations being uniformly distributed under the entire surface of the false bottom of the filter. The air rising through the filtering material agitates it, and the filtered water, of which a suitable quantity is held in reserve in flush tanks provided for the purpose, flows back through the valve E. By this action the impurities are separated and washed away through the waste outlet F. The air escapes through the cock G, and the steam is, of course, condensed. About three minutes is usually long enough for the injector to be kept in operation; but it is necessary to allow the filtered water to flow backwards through the filter for about two minutes longer in order to ensure the thorough cleaning of the filtering material and the entire removal of air. Experience shows that frequent cleaning, necessitating only short flushing, is better than allowing the filter to run until the material is nearly clogged up.

The other purifying plants installed in Manchester, and in most of those installed elsewhere, are fitted with the filter shown on Fig 6A (Plate 5). It differs from the one last described in that the false-bottom plates and wire mesh are dispened with, and the perforated pipes, through which the filtered water passes to the outlet leading to the bath, and by which the mixture of steam and air for cleaning purposes is admitted, are embedded in a layer of granite chippings over which a bed of gravel about 18 in. in thickness is arranged, and finally on the top a layer of fine sand about 6 in. in thickness. The perforated pipes are of copper, and are carried on wooden supports in order to avoid any risk of electrolytic action being set up in the filter. The shell is made either of steel or cast-iron, and is either circular or rectangular in shape. This filter has proved the best of the types tried in Manchester.

The section on Plate 6 represents the general arrangement of the installation at Moss Side baths, all the main parts of which are similar to the corresponding parts of the Victoria Baths installation, with the exception of the aërator, which consists of a series of open wooden trays or channels superimposed and arranged in such a manner that the water runs in a thin sheet over the trays in a zig-zag fashion, and finally runs from the lowest tray along a channel into an open filter. The filter is the same as that described for Victoria Baths, with the exception that it has an open top instead of being closed.

It is claimed for the system of continuous aeration and filtration that it provides greatly improved and uniform conditions in the baths without adding to the [illegible] expense, that it results in a considerable saving in the quantity of water used [illegible]. In some places, probably on sentimental reasons, the public [illegible] to [illegible] the [illegible] water provided the purifying plant is large enough, and that it is given sufficient attention to ensure its efficient working. If the agencies that contribute to the pollution of the water can be successfully counteracted for a few weeks, why not indefinitely?

It may be urged, and rightly so, that economy, where the public health is concerned, is a matter of secondary consideration, and the author has no desire to dwell overmuch on the economic advantages of the system; but for the benefit of those who are utilitarians first and last, it may be stated that the system is capable of effecting economies in addition to the saving of water. The labour involved in emptying, cleaning and refilling swimming baths forms a considerable proportion of the running charges where a purifying plant is not in operation. The author is informed on reliable authority that the work costs about 25s. per week per bath if changed twice weekly, or, say, £65 per annum for baths open all the year round.

The cost of a complete purifying installation varies between £700 and £1,000, according to size and circumstances; the average may be taken at £800. In the case of new baths, if a purifying plant is installed there is a saving in the initial cost of the steam-raising plant

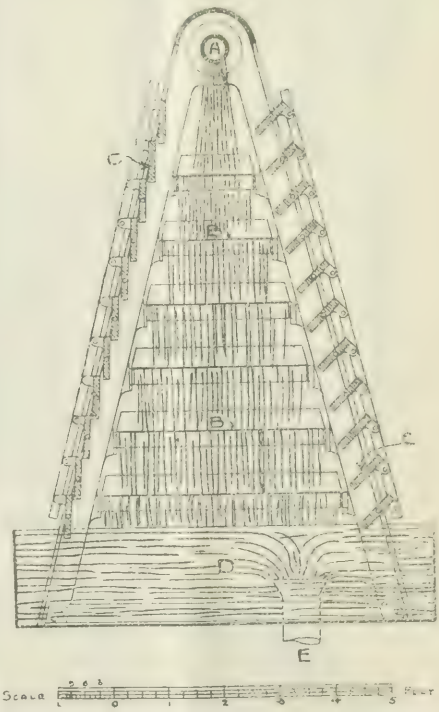


Fig. 5.—Manchester Corporation Victoria Baths: Detail of Aërator.

A—Discharge pipe from pump; B—Perforated trays; C—Adjustable louvres, D—Receiving tank; E—Outlet to filter.)

at least £200, as the plant need not be nearly so large. The net amount of extra capital involved by the addition of a purifying plant is therefore about £500. Allowing 7½ per cent per annum for interest, depreciation and maintenance, which experience has shown to be ample, the annual charge in respect of

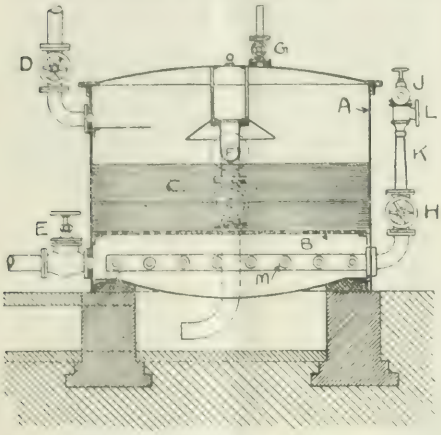


FIG. 6. MANCHESTER CORPORATION VICTORIA BATHS: SECTION OF RUSSERT FILTER.

(A—Cylindrical steel casing; B—Perforated false bottom; C—Filtering material; D—Unfiltered water inlet valve; E—Filtered water outlet valve; F—Waste outlet; G—Air outlet cock; H—Compressed air inlet valve; J—Steam inlet valve; K—Steam injector; L—Air inlet to injector; M—Perforated pipes for air.)

the plant is about £45, or £20 less than the cost of labour where the plant is not in operation.

The reason a much larger steam-raising plant is necessary for dealing with baths that have to be entirely emptied and refilled two or three times a week is that the temperature of the whole body of water put into the bath has to be raised from about 50 deg. Fahr. to about 78 deg. Fahr. in a comparatively short time. On the other hand with the purifying system in operation, the demand for steam is represented by the amount required to make up for radiation losses, which is found from experience to be that necessary to raise the temperature of the volume of water in circulation through about 8 deg. Fahr.

Taking as an example the case of a swimming bath open to the public for fifteen hours daily, viz., from 6 a.m. to 9 p.m., this leaves nine hours in which the bath has to be emptied, cleaned and refilled with fresh water, an operation occupying not less than three hours; therefore the time available for heating the fresh water put into the bath is about six hours, during which time the temperature of the water has to be raised about 28 deg. Fahr. Supposing the bath were fitted with a purifying plant, and the entire contents were circulated once every six hours, the temperature of the whole of the water contained in the bath would have to be raised through about 8 deg. Fahr. in that time; therefore the ratio of the capacity of the steam-raising plant in the former case to that required in the latter case would be as 28 is to 8, or as 3·5 is to 1. It is here assumed that the exhaust steam from the circulating pump is utilised for reheating the water on its way back to the bath, which is usually about 40 per cent of the total quantity of steam necessary to raise the temperature to the required extent.

DISCUSSION OF MR. HOLME LEWIS' PAPER.

The PRESIDENT (Mr. T. Molyneux) said he was sure they had all been pleased to hear Mr. Lewis, who was one of those modest men who hid his light under a bushel. The paper was a most interesting and a most practical one, and one which would prove very useful to anyone proposing to put in a bath. They had a similar bath in Stockport, and he could bear out Mr. Lewis' figures as to the cost of the installation. The author had said that the average cost might be taken at £800. Their bath at Stockport held 75,000 gallons, and the installation for emptying and refilling that had cost just £800. They charged the bath at the rate of 6d. per 1,000 gallons, and since the installation had been in use the saving in the cost of water had averaged about £60 per annum. The bath superintendent told him that it had made no difference whatever to clearing out the bath, except that they carried 10 lb. more steam on the boiler. That was exceedingly satisfactory. The bath had been filled once this year, and it had not yet been emptied. He had much pleasure in proposing a vote of thanks to Mr. Holme Lewis for his paper. They ought to be exceedingly grateful to Mr. Lewis for having written such an exhaustive and interesting paper, and for having found time to read it to the institution.

Mr. H. ASHTON HILL (Birmingham) seconded the resolution. He said the paper was a very practical one, and many of them would doubtless find it of great use in the future.

Mr. J. DERBYSHIRE (Manchester) said he was very pleased that Mr. Holme Lewis had written the paper, as he believed that the more the arguments which he had used were considered, and the more they were examined, the more converts there would be to his way of dealing with water in swimming baths. It was his (the speaker's) good fortune to be in at the birth of these trials, and to-day they in Manchester stood as the only municipality in the world where every one of their swimming baths was fitted with this installation. When the first and last word had been said on the subject, there were only two systems known—one was to empty their bath at their whim and fancy when they considered it to be dirty; and from opening to closing time they had a continuous stream of bathers. The result was to pollute the water so that the only time that the bath was in the condition they had a right to expect was in the early stages of the first filling, and no attempt had ever been made until this system was introduced, of giving equality of conditions. Those who could pay higher prices, or who, if his convenience would allow him,

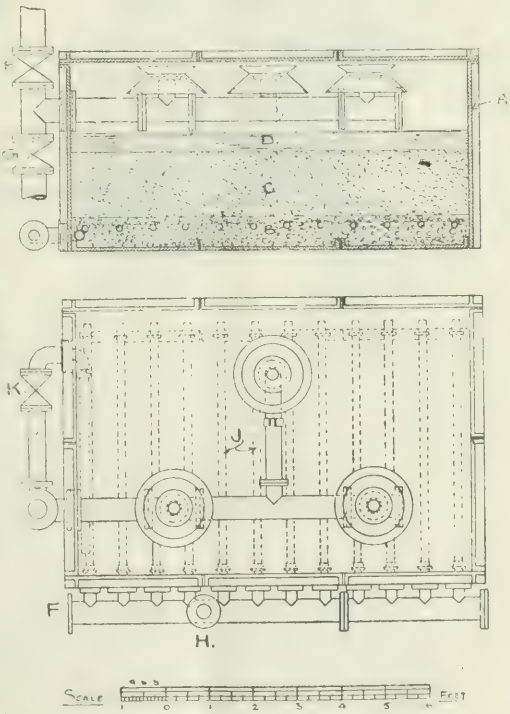


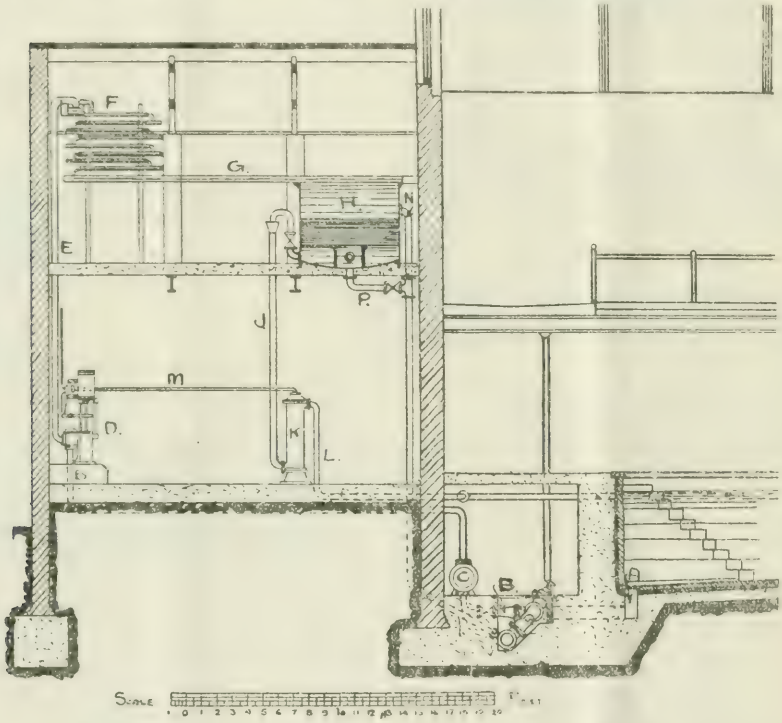
FIG. 6A. ROW'S IMPROVED FILTER.

(A—Cast-iron casing; B—Granite chippings; C—Pearl gravel; D—Sand; E—Unfiltered water inlet valve; F—Filtered water outlet; G—Waste outlet; H—Compressed air inlet; J—Perforated pipes for air; K—Drain valve.)

(Plate 5.)

attended the bath in its early stages got the plum, while those who were compelled to attend the bath on emptying night were compelled to bathe in water which a few hours after would be emptied down the drain; and those who were privileged to see that water when the last bather had left it would, he was sure, feel that the system described by Mr. Holme

[illegible] Wells argued to the contribution of the author Prof. Hopkins had taken samples from some of those baths that were in use for twenty years, and his (the speaker's) contention was that if they could realize the only [illegible] of a thousand pounds [illegible] they would [illegible] a [illegible] as long as they liked. At last the medical authorities of this country [illegible] Mr. Lewis was particularly correct [illegible] the last few years. Their contention was that the question of cost should at [illegible] be considered. After all, a municipality that possessed the knowledge that it was possible, with a reasonable expenditure, to give to the people cleaner and more pleasurable conditions, would be [illegible] in not taking advantage of that [illegible] had placed at its disposal. He would like to give a hearty invitation to any members of the institution whenever they were in Manchester to pay a visit to the baths—they had nothing to hide. That was one of those systems of which they were only too pleased to tell all they knew. He asked them to make as many inquiries as they could, because up to the present they had never failed to convert anybody who had inspected the installation.



General Arrangement of Moss Side Baths Installation, Manchester.

(A—Outlet grid at deep end of bath; B—Connecting pipe to suction of circulating pump; C—Strainer in line of suction pipe to arrest coarse matter; D—Steam driven circulating pump; E—Delivery pipe from pump to aerator; F—Aerator; G—Open channel connecting aerator to filter; H—Filter; J—Connecting pipe from filter to reheater; K—Reheater; L—Connecting pipe from reheater to shallow end of bath; M—Steam exhaust pipe from circulating pump to reheater; N—Overflow pipe from filter, connected to drain; P—Washout pipe from filter, connected to drain; O—Connecting pipe from deep end of bath to drain.)

(Plate 6.)

Mr. H. C. Head said that Mr. Lewis had given them some very interesting figures regarding the capacity of the steam plant, and he would like, if possible, to have the figures with regard to coal consumption.

Mr. W. T. Burgess (London) said that the process was really a continuous use of the same water over and over again, and it was perfectly evident that a good fraction of the water was used for washing the filter plant, and consequently there was an everlasting passage of fresh water into the system. In the analysis at the end of the paper they were able to get some idea of what the purity of the water was under the system, and it was quite surprising to him. He was surprised to find that the water, after being used in this way should be chemically, as pure as it was. He would only suggest that this relative purity must be kept up by the constant addition and passage into it of fresh water, and must come from the mains. Washing was mentioned in the paper, and he thought it was better to do it frequently than at longer intervals [illegible] a loss of water. He would like the author to give them some idea of what proportion of the water was used in washing, and consequently was replaceable.

Mr. Hetage Lewis, in reply, said that, with respect to the cost of the tests, there were no actual tests made [illegible] of the saving in fuel, but he was informed that it ought to be taken at something from 7 to 10 per cent. of saving as compared with the system of interchanging water at the baths every two or three days. As to the amount of water consumed in flushing the filters, that, of course, would vary according to the use made of the baths; but the suggestion that the filters should be frequently cleaned and not necessarily indicate that a larger amount of water was used than if they were kept in use for longer periods. The shorter the time the filter was in use the less amount of water it required for flushing. If they ran the filter for three or four days, and then cleaned it, it took less water than if they allowed it to run double that time. The water used for flushing was by no means large—it was anything from 1 to 3 per cent of the total. In addition, of course, there was the evaporation which took place, and he was not in a position to say how frequently the contents of a bath which was supposed not to be changed was actually changed, but the figures which he had been able to collect from various authorities would give an idea of the saving in water, and it would be found that it was very substantial. His intention was to put on record an account of a system that had not been very long in existence, and one which most concerned water engineers—that was the supply of suitable water for public baths. Another reason

which prompted him when he was asked by the president to contribute something to their meeting was that he conceived it to be the duty of every member to do what he could in helping by writing papers, more particularly if they could discuss a subject in which the saving of water formed an important part.

VOTES OF THANKS.

Mr. C. Clemesha Smith (Wakefield) said it afforded him great pleasure to ask them to accord a vote of thanks to the mayor and corporation of Stockport for the cordial welcome and the generous hospitality they had extended to the institution. During the existence of that institution they had always been fortunate in receiving a very hearty welcome from the corporation in whatever town they had met, but the warmth of their welcome and the hospitality accorded them at Stockport had never been exceeded.

Mr. William Whitaker (Croydon), in seconding the resolution, said he was sure they could all bear witness to the hospitality which they had received at Stockport. Not only had they had the pleasure of the attendance of the mayor and the chairman of the Water Committee, but they had personally looked after their comfort in many ways.

The vote was carried.

Mr. H. C. Head (Winchester), in proposing a vote of thanks to the president for his hospitality and for the excellent arrangements made for the comfort and entertainment of the members, said that perhaps the highest compliment he could pay Mr. Molyneux was to say that everything in connection with the meetings had gone on as if it had happened, and not been arranged.

Mr. F. W. Mc Culloch (Belfast) seconded the vote, which was carried with enthusiasm.

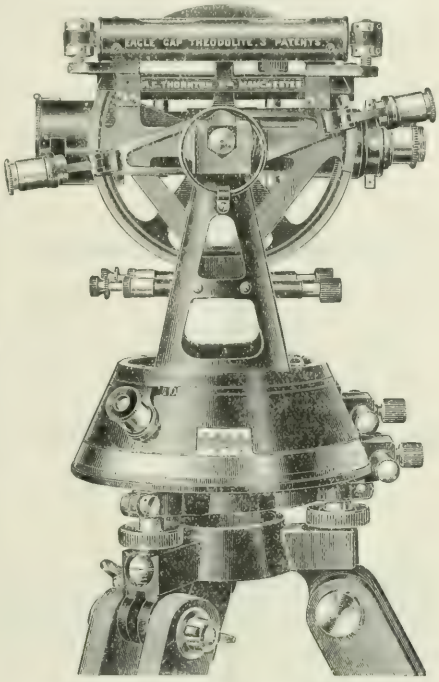
The President, in reply, said he was greatly obliged for the vote of thanks which they had passed, but there was no necessity for it. It had been been his duty to do what he had done; he had done it willingly and with great pleasure to himself and to his corporation. He would like to remind them that the institution would be holding its winter meeting in London on December 11th and 12th. Owing to the increasing interest being taken in the institution, it would be necessary to hold a two days' meeting, as the usual Saturday morning would not be sufficient.

THE "EAGLE" THEODOLITE.

Impressed with the need that appeared to exist for an improved type of theodolite, designed more particularly for the mining engineer's work, Messrs. A. G. Thornton, Limited, Paragon Works, Kingsstreet, West Manchester, determined on the production of the instrument required, and the result of their efforts, after three years' continuous experimenting, is to be seen in the "Eagle" patent theodolite, of which some particulars have been submitted to us. This instrument bears the name of Mr. George Eagle, surveyor, who originated the principles on which it is constructed, and who has advised the firm throughout in their endeavours to produce the desired theodolite.

Messrs. Thornton contend that at the present time the most approved type of instrument that is being produced for mining work has all the disadvantages of which the mining engineer complains—a theodolite having the addition of auxiliary telescope, balance weights, and numerous other extra fittings which such additions necessitate. The firm add: "For situations in which sights must be taken downwards within 40 deg. of the vertical, various forms of theodolites with eccentrically mounted auxiliary side or top telescopes have been designed. In almost every one of these situations only one sight of extreme dip has been required from any given station, and to meet such a simple requirement the 'Eagle' theodolite has been designed. In this instrument a gap has been cut in the horizontal plates of the instrument between the hollow centre and the graduated horizontal circle. The tripod of the theodolite may be so set up at a station that in one required horizontal direction from that station (or within 5 deg. of that direction) a sight may be taken at any angle from the vertical without the use of an auxiliary telescope. A one telescope only is sufficient for all purposes, we have felt justified in giving this special consideration in order to obtain the best possible definition. In order to obtain a view through the horizontal plates a gap has been cut from the hollow centre to the circumference, except through the graduated circle and cone centres, which could not be cut away without detroying the instrument. These parts which could not be cut away have been arranged to form parts of two cones with the common apex of the two cones at the centre of the transit axis, where the horizontal and vertical axes intersect, with the result that, viewed from this intersection, these parts appear only as two narrow bars across the gap. As these bars are so near the object glass, they are not visible through the telescope, and do not interfere with or spoil the definition. They cut off a certain amount of light which is only just noticeable, and which has been allowed for by making the object glass of slightly larger diameter than usual."

From the accompanying illustration it will be seen



that the whole instrument is very compact, and it is important to note that the various milled heads of the focussing, pinion, adjusting and tangent screws have been brought out well away from the instrument to ensure plenty of finger room. It has been made as squat as possible without losing any height necessary for accuracy or strength; further, as the main telescope can be used for every sight, the instrument is symmetrical, and it is not necessary to use balance weights.

Talbot Cars.—So far nearly thirty highest awards alone have been won by Talbot cars in speed and reliability trials this season, proving how well the 1914 models are upholding the very best traditions of the "Invincible" Talbot.

Sewerage and Water Supply at Upton-on-Severn.—In his last annual report Mr. M. D. Price, sanitary surveyor to the Upton-on-Severn Rural District Council, states that the whole of the schemes of sewerage and water supply for the village of Powick have been carried out at a cost of £1,443 15s. 3d. The water supply scheme cost £241 2s., the well-sinking £142 5s. 7d., and the sewerage and sewage disposal £1,060 7s. 8d.

A Glossary of Road Terms. By H. Percy Boulnois, M.Inst.C.E. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 2s. Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he had made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before. *Portsmouth Times.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. Pickering, M.Inst.C.E., Borough Surveyor and Water Engineer, Cheltenham.

EASTERN DISTRICT.

An Eastern District meeting will be held at Tilbury [illegible].

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future.

J. W. Dudley Robinson, B.Sc.(Lond.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

NORTHERN DISTRICT.

Meetings will be held at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. Wyand,
Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY ASSISTANT SURVEYOR.—July 4th.—Failsworth Urban District Council. £2 per week.—Mr. H. C. Broome, clerk.

SANITARY INSPECTOR.—July 4th.—Lewisham Borough Council. £150—£200.—Mr. E. W. Wright, town clerk, Town Hall, Catford, S.E.

TEMPORARY ASSISTANT.—July 4th.—Corporation of Chard. £78 per annum.—Mr. E. W. Hearn, borough engineer and surveyor.

ASSISTANT SURVEYOR. — July 4th. — Antrim County Council. £120.—Mr. A. Millar, deputy secretary, County Courthouse, Belfast.

ASSISTANT ENGINEER AND SURVEYOR.—July 4th.—Hornsey Town Council. £200—£250 per annum.—Mr. E. J. Lovegrove, borough engineer, Municipal Offices, Highgate, N.

SURVEYOR'S ASSISTANT.—July 4th.—Kidderminster Rural District Council. £1 10s. per week.—Mr. G. J. Shepherd, surveyor, 85 Chester-road, Kidderminster.

BOROUGH SURVEYOR'S ASSISTANT.—July 6th.—Corporation of Loughborough. £120 per annum.—Mr. Henry Perkins, town clerk.

SECOND ASSISTANT.—July 6th.—Devon County Council. £2 2s. per week.—Mr. R. M. Stone, county surveyor (northern division), The Square, Barnstaple.

CLERK OF WORKS.—July 6th.—Devon County Council. £3 per week.—Mr. W. P. Robinson, county surveyor (No. 2 division), 22 Queen-street, Exeter.

CLERK OF WORKS.—July 6th.—Ruislip-Northwood Urban District Council. £3 3s. per week.—Mr. Edmund R. Abbott, clerk, Northwood, Middlesex.

BUILDINGS SURVEYOR.—July 7th.—Henley-on-Thames Rural District Council.—Mr. A. R. Lloyds, clerk.

CLERK OF WORKS.—July 7th.—Minchead Urban District Council.—Mr. L. C. Webber-Incledon, clerk.

ASSISTANT COUNTY SURVEYOR.—July 8th.—Somerset County Council. £200 per annum.—Mr. Edward Stead, county surveyor, Wells.

INSPECTOR OF NUISANCES.—July 11th.—Nantwich Urban District Council. £90 per annum.—Mr. A. E. Whittingham, clerk.

SURVEYOR AND INSPECTOR.—July 11th.—Hay Urban District Council. £100 a year.—Mr. Robert T. Griffiths, clerk, Hay, viâ Hereford.

RESIDENT ENGINEER.—July 14th.—Corporation of Warwick. £3 3s. per week.—Mr. B. Campbell, town clerk.

ASSISTANT SANITARY INSPECTOR.—July 15th.—Highland District Committee of the Perth County Council. £100.—Mr. R. McNicoll, County Buildings, Perth.

CITY SURVEYOR.—August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

DISTRICT ENGINEER.—Public Works Department of the British Guiana Government. £300—£400 per annum.—Crown Agents for the Colonies, Whitehall-gardens, London.

YOUTH.—Surrey County Council.—Mr. A. Dryland, county surveyor, County Hall, Kingston.

MUNICIPAL COMPETITIONS OPEN.

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MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

REIGATE.—July 25th.—Designs for a police and fire station, for the Corporation of Reigate. Premiums 40, 20, and 10 guineas.—Mr. A. Smith, town clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ILFORD.—July 4th.—For laying wood block flooring at a school, for the Education Committee.—Mr. H. Shaw, engineer and surveyor.

ECCLES.—July 4th.—For cleaning and repairing the town hall and other work, for the corporation.—Borough Surveyor.

ESSEX.—July 4th.—For alterations and additions to a school, for the Education Committee.—County Architect, 73 Duke-street, Chelmsford.

HAMPSHIRE.—July 6th.—For the erection of a class-room, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

LOWESTOFT.—July 6th.—For the erection of new buildings, and alterations to town hall, for the corporation.—Mr. G. H. Hamby, borough surveyor.

WATFORD.—July 6th.—For the erection of a pumping station, including engine-house, basement, machine shop, boiler-house, filter-house, lime store, and softening tank, for the urban district council.—Mr. D. Waterhouse, engineer, Council Offices, High-street, Watford.

MERTHYR.—July 6th.—For school extension, for the Education Committee.—Mr. R. Elias, director of education.

HALIFAX.—July 6th.—For the erection of a public convenience, for the corporation.—Mr. J. Lord, borough engineer.

SWINDON.—July 6th.—For extensions to a school, for the corporation.—Mr. H. J. Hamp, borough surveyor.

WARBLINGTON.—July 6th.—For the erection of a cottage, for the urban district council.—Mr. A. J. Martin, 7 Victoria-street, Westminster.

HASTINGS.—July 6th.—For the erection of new buildings at disinfecting station, for the corporation.—Mr. P. H. Palmer, borough engineer.

HALIFAX.—July 6th.—For the extension of the technical college, for the Education Committee.—Mr. J. Lord, borough engineer.

ALNWICK.—July 6th.—For cementing wagonway and erecting thirty-two metal pens, for the urban district council.—Mr. J. Balmbra, clerk.

BRADFORD.—July 7th.—For the erection of forty-five workmen's dwellings, for the corporation.—City Architect.

MOUNTAIN ASH.—July 7th.—For constructional works at various schools, for the Education Committee.—Mr. W. H. Williams, architect, Town Hall.

NEWARK.—July 7th.—For the erection of handicraft and domestic centres, for the Education Committee.—Mr. H. W. Lockton, architect, Newark.

TONBRIDGE.—July 7th.—For the erection of twenty-five pairs of cottages, for the rural district council.—Mr. Frank Harris, surveyor.

WINCANTON.—July 7th.—For the construction of a reservoir, for the rural district council.—Mr. E. A. Rankin, engineer, Bourton, Dorset.

WESTMINSTER.—July 8th.—For internal and external painting works and repairs at the Marshall-street public baths, for the city council.—City Engineer, City Hall, Charing Cross-road, W.C.

LANCASTER.—July 8th.—For alterations to the market lavatory, for the corporation.—Borough Surveyor.

ALDERSHOT.—July 8th.—For work at the cemetery, including repairs to walls and fences, for the Burial Board.—Messrs. Friend & Lloyd, architects, Aldershot.

SAFFRON WALDEN.—July 8th-20th.—For additions to hospital, for the Joint Hospital Board.—Mr. H. R. Bird, architect, 10 Union-street, Old Broad-street, E.C.

CARLISLE.—July 9th.—For the extension of electric lighting station, for the corporation.—Mr. H. C. Marks, city engineer and surveyor.

OSWALDTWISTLE.—July 9th.—For the erection of a public library, for the urban district council.—Mr. F. Q. Farmer, architect, 14 Little Park-street, Coventry.

LAUNCESTON.—July 9th.—For the erection of twenty-four cottages, for the corporation.—Town Clerk.

AYR.—July 9th.—For constructional works at the Loch Finlas waterworks, for the corporation.—Mr. John Young, water engineer.

GLASGOW.—July 9th.—For the construction of an embankment on the Clyde for the corporation.—Office of Public Works, 64 Cochrane-street.

HEBDEN BRIDGE.—July 10th.—For repairs to schools, for the Education Committee.—Mr. F. J. MacDonald, Education Offices, Sowerby Bridge.

GLASGOW.—July 10th.—For the digger and reinforced-concrete work at Dalmarnock Bridge new electricity station, for the corporation.—Mr. W. W. Lackie, electrical engineer, 75 Waterloo-street.

WEST RIDING.—July 10th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

CROYDON.—July 10th.—For the erection of a school, for the Education Committee.—Education Office, Katherine-street, Croydon.

MILFORD.—July 11th.—For building eleven cottages, for the rural district council.—Mr. S. Waters, clerk.

MIDLETON.—July 11th.—For the erection of twenty-five labourers' cottages, and for the completion of 193 other cottages, for the rural district council.—Mr. J. Stanton, clerk.

HALIFAX.—July 11th.—For the erection of a cable shed at electricity works, for the corporation.—Mr. J. Lord, borough engineer.

CORNWALL.—July 11th.—For the erection of a handicraft centre, for the Education Committee.—Mr. B. C. Andrew, architect, Biddick's-court, St. Austell.

SUNDERLAND.—July 11th.—For the erection of a training college and hostels, for the corporation.—Borough Surveyor.

HITCHIN.—July 13th.—For the erection of an isolation hospital, for the rural district council.—Mr. A. E. Passingham, clerk.

HAMPSHIRE.—July 13th.—For the extension of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

COVENTRY.—July 13th.—For the erection of two pump-houses at waterworks, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

BRIDGWATER.—July 13th.—For alterations and additions to school building, for the Higher Education Committee.—Messrs.—Samson & Colthurst, architects, 51 High-street, Bridgwater.

DUNDALK.—July 14th.—For the erection of forty-six houses and contingent works, for the urban district council.—Mr. M. Sellars, surveyor, Town Hall.

HAMPTON.—July 14th.—For the extension of the isolation hospital, for the urban district council.—Mr. S. H. Chambers, surveyor.

CROYDON.—July 14th.—For the erection of a covered steel shed, for the corporation.—Borough Engineer.

CROYDON.—July 15th.—For alterations and additions to school, for the Education Committee.—Mr. J. Smyth, clerk, Education Office, Katherine-street, Croydon.

KESTEVEN.—July 15th.—For additions and alterations to schools, for the Education Committee.—Mr. H. Donaldson, County Education Office, Grantham.

EXMOUTH.—July 16th.—For the supply and laying of 10-in. cast-iron pipes, sluice valves, 10-in. cast-iron pipe line, 8-in. steel pipe line, and other necessary works, for the urban district council.—Mr. S. Hutton, engineer and surveyor.

HERTS.—July 20th.—For the enlargement of Byng-road county council school, Barnet, for the Education Committee.—Mr. Urban A. Smith, county surveyor, Hatfield.

WEST HAM.—July 23rd.—For the erection of dwelling houses, for the Port of London Authority.—Mr. C. R. S. Kirkpatrick, 109 Leadenhall-street, E.C.

GRANTHAM.—For the erection of two cottages, for the corporation.—Borough Surveyor, Guildhall.

Iron and Steel.

TIPTON.—July 4th.—For the supply of a Lancashire boiler, for the urban district council.—Mr. S. O. Stephenson, engineer and surveyor.

GOOLE.—July 6th.—For the erection of a 4-ton travelling crane, for the urban district council.—The Clerk.

BELPER.—July 9th.—For laying cast-iron mains, for the rural district council.—Mr. G. Pym, clerk.

ST. PANCRAS.—July 13th.—For supplying and fixing a Cornish boiler at public baths, for the borough council.—Mr. C. H. F. Barrett, town clerk.

CHELMSFORD.—July 13th.—For the supply of cast-iron pipes for water mains, for the corporation.—Mr. G. Melvin, town clerk.

LONDON.—July 16th.—For the supply and erection of steel and iron work at Battersea, for the Metropolitan Water Board.—Engineer, Savoy-street, Strand, W.C.

Roads.

GODSTONE.—July 4th.—For the supply of tar-macadam and bituminous materials, kerbing, channelling, tools, oils and iron goods, and hire of steam rollers, for the rural district council.—Mr. Geo. Crowter, engineer and surveyor.

ILFORD.—July 4th.—For repairing tar-pavings, for the Education Committee.—Mr. H. Shaw, engineer and surveyor.

SAFFRON WALDEN.—July 4th.—For making up a road, for the corporation.—Mr. A. H. Forbes, borough surveyor.

RUISLIP-NORTHWOOD.—July 4th.—For making up Hilliard-street, Northwood (about 600 yds.), for the urban district council.—The Surveyor, Council Offices, Northwood.

RUISLIP-NORTHWOOD.—July 4th.—For making up part of Dene-road, Northwood (about 260 yds.), for the urban district council.—The Surveyor, Council Offices, Northwood.

HARROW.—July 4th.—For the supply of broken granite, granite chippings, tarred granite, and tarred granite chippings, for the urban district council.—The Surveyor.

KEYNSHAM.—July 6th.—For making up a road, for the rural district council.—Mr. H. M. Bennett, surveyor, 36 Corn-street, Bristol.

SEAFORD.—July [illegible].—For the supply of 1,000 [illegible] for the urban district council.—The Surveyor.

BROMLEY (Kent).—July 6th.—For works of private street improvement in Somerset-road, Wiltshire-road and St. John's-road, for the rural district council.—The Surveyor, Maulden House, Sideup-hill, Sideup.

LOUGHTON.—July 6th.—For the supply of granite and gravel, and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

SKIPTON.—July 6th.—For the supply of tarred limestone and tarred slag, for the urban district council.—Mr. Aldridge, town hall.

WANDSWORTH.—July 6th.—For making up part of [illegible], for the borough council.—Mr. P. Dodd, borough engineer.

EDMONTON.—July 6th.—For the supply of York stone coping, for the urban district council.—Mr. C. [illegible].

WANDSWORTH.—July 7th.—For wood paving and other works in Streatham High-road, and Streatham-hill, for the borough council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

TEWKESBURY.—July 7th.—For supplying and laying wood paving, for the borough council.—The Borough Surveyor.

MAESTEG.—July 7th.—For private street improvement works, for the urban district council.—Mr. S. J. Harpur, engineer.

STOKE.—July 8th.—For making up several streets, for the corporation.—Borough Surveyor.

NEWPORT (Mon.).—July 8th.—For private street works, for the corporation.—Borough Engineer.

HAMMERSMITH.—July 8th.—For paving the carriageways and footways of Letchford-mews and Willow-vale, for the borough council.—Mr. H. Mair, borough surveyor.

HORNSEY.—July 8th.—For paving works with creosoted deal blocks, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

HACKNEY.—July 9th.—For the construction of carriageways with creosoted yellow deal blocks, for the borough council.—Borough Engineer and Surveyor.

BARNSTAPLE.—July 10th.—For steam rolling and scarifying, for the corporation.—Mr. E. Y. Saunders, borough surveyor.

INVERURIE.—July 10th.—For the construction of concrete pavement and granite kerb, for the corporation.—Mr. J. Milne, burgh surveyor.

DUNSTABLE.—July 10th.—For the supply of broken slag, slag dust and slag tar-macadam, for the corporation.—Mr. W. F. Wilkins, borough surveyor.

ABERYSYCHAN.—July 11th.—For road improvement and sewerage, for the urban district council.—Mr. E. Whitwell, surveyor.

ST. HELENS.—July 13th.—For granite paving work, for the corporation.—Mr. A. W. Bradley, borough engineer.

BROADSTAIRS.—July 13th.—For the supply of a 10-ton steam roller with scarifier, for the urban district council.—Mr. H. Hurd, surveyor.

ROMFORD.—July 13th.—For the supply of blue Guernsey granite, for the rural district council.—Mr. G. Lapwood, highway surveyor.

SOUTHALL-NORWOOD.—July 14th.—For road works, for the urban district council.—Mr. Reginald Brown, engineer and surveyor.

CAERLEON.—July 14th.—For the supply of limestone, kerb, channel, and paving, for the urban district council.—Mr. C. J. Fox, surveyor.

ST. MELLONS.—July 15th.—For widening and improving a road, for the rural district council.—Mr. Gomer S. Morgan, engineer, Pontypridd.

WELLINGTON.—July 15th.—For the supply of tarred macadam and broken granite, for the urban district council.—Mr. G. Riley, surveyor.

CHELMSFORD.—July 15th.—For paving Duke-street with creosoted deal blocks, for the corporation.—Mr. P. T. Harrison, borough engineer.

SHEFFIELD.—July 16th.—For asphalting work, for the corporation.—City Architect.

ARGYLL.—July 18th.—For road repair, widening, and improvement, for the Cowal District Committee.—Messrs. W. & W. Disselduff, joint district clerks, 160 Argyll-street, Dunoon.

MARGATE.—July 20th.—For the supply of 1,500 tons of unbroken pit flints, and 1,000 tons of 2-in. broken and sifted pit flints, for the corporation.—Mr. E. A. Borg, borough surveyor.

PERTHSHIRE.—July 31st.—For the reconstruction of 25 miles of road through Glen Dochart, Glen Falloch and Strath Fillan, in the parish of Killin, for the Western District Committee.—Mr. W. L. Gibson, engineer and surveyor, Post Office Buildings, Dunblane, Perthshire.

Sanitary.

RUISLIP-NORTHWOOD.—July 4th.—For the construction with iron or earthenware pipes of 362 yds. of 9-in. sewer at Eastcote, for the urban district council.—The Surveyor, Council Offices, Northwood.

BRANDON AND GYSHOTTLES.—July 4th.—For sewage works extension, for the urban district council.—Mr. G. G. Donkin, surveyor, Langley Moor.

WEST SUFFOLK.—July 7th.—For the construction of stoneware pipe drain, for the county council.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

PRESTON.—July 7th.—For alterations at sewage disposal works, for the rural district council.—Messrs. Myers, Veevens & Myers, 15 Chapel-street, Preston.

WEALDSTONE.—July 7th.—For the construction of rotating sewage distributors, feed pipes, cast-iron socketed pipes, bends, and junctions, for the urban district council.—Mr. H. Walker, engineer and surveyor.

WESTBOURNE.—July 7th.—For scavenging work, for the rural district council.—Mr. J. W. L. Cooper, clerk.

DURHAM.—July 8th.—For the removal of house refuse, for the rural district council.—Mr. J. Menzies, sanitary inspector, Avenue House, Shincliffe, Durham.

WREXHAM.—July 9th.—For work of sewer construction, for the corporation.—Mr. J. England, borough engineer.

BELPER.—July 9th.—For the construction of sewage disposal works, for the rural district council.—Mr. R. C. Cordon, surveyor, Duffield, near Derby.

LICHFIELD.—July 9th.—For the construction of sewage purification works, filters, and manholes, also for laying approximately 1,820 yds. of 15-in., 4,860 yds. of 9-in., and 2,000 yds. of 6-in. stoneware socket pipes, and erecting ventilating columns, for the rural district council.—Mr. C. O. Rawstron, engineer.

ASHFORD.—July 9th.—For the construction of an ejectment station with pneumatic ejectors and air-compressing plant, 240 yds. of 6-in. rising main, and a set of sewage purification works, for the West London District School Managers.—Mr. Arthur Martin, 7 Victoria-street, Westminster, S.W.

HARROW.—July 11th.—For works of sewerage, for the urban district council.—Mr. J. P. Bennetts, engineer and surveyor.

ECCLES.—July 11th.—For a 5 to 6 b.h.p. oil engine, and 5-in. centrifugal pump piping, for the sewage disposal Committee.—Mr. G. W. Willis, sewage works engineer and manager, Peel Green-road, Patricroft.

BARROWFORD.—July 11th.—For the construction of sewage disposal works, for the urban district council.—Mr. F. Sutcliffe, surveyor.

HENDON.—July 13th.—For the removal of house refuse, for the urban district council.—Mr. S. S. Grimley, surveyor.

LEYBURN.—July 14th.—For laying sewers and constructing sewage disposal works, for the rural district council.—Mr. F. J. Rodwell, engineer, 37 and 38 Prudential Assurance Buildings, Park-row, Leeds.

WALTON-ON-THAMES.—July 14th.—For laying iron and stoneware sewers, for the urban district council.—Mr. R. Wilds, surveyor.

SEFTON.—July 15th.—For the construction of pipe sewers, for the rural district council.—Mr. J. T. Wood, engineer, 3 Cook-street, Liverpool.

SCARBOROUGH.—July 15th.—For a sewage purification installation, for the rural district council.—Mr. J. A. Iveson, surveyor.

SOUTH SHIELDS.—July 16th.—For the construction of sewers, for the corporation.—Mr. L. Roseveare, borough engineer.

RAWTENSTALL.—July 16th.—For the construction of sewers and manholes, for the corporation.—Mr. J. Johnson, borough engineer.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Rural Road Administration.

One of the most interesting of the papers read at the annual meeting of the Institution of Municipal and County Engineers was that on the "Control, Management, and Maintenance of Rural Roads," by Mr. J. F. Hawkins, county surveyor of Berkshire. This paper, together with the discussion, is reported in another part of the present issue. Mr. Hawkins discussed the relations between road authorities—more especially with regard to the sizes of the areas controlled and he expressed himself as strongly in favour of important changes. The considerations to which he drew attention may be regarded as pointing to the desirableness of combining small areas, or of suppressing rural districts altogether as far as their highway duties are concerned, bringing all rural roads under the management of the county councils. Some highway engineers, on the other hand, may consider that his presentment of the position points to the advantages of creating, in effect, a single road maintenance service by the establishment of suitable relations between the existing authorities, the equitable adjustment of the cost of maintenance, and the establishment of a system under which all highway surveyors would be virtually members of one organisation. It may be taken for granted that those who hold views such as these recognise that an essential element of such a system is the establishment of effective control by the central authority, especially as regards the pay, promotion, and security of tenure of road engineers. As we have more than once pointed out, matters have for some time been tending towards developments which will leave but two alternatives—there will either be a distinct road engineering staff under the direct control of the central authority, and armed with considerable powers as regards inspection and reporting, or there must be established such a system that all surveyors will be virtually members of a single corps, the position of each individual being exactly defined as regards those above and below him in rank. As was pointed out in the discussion by Mr. Weeber, the present administrative counties are in many cases quite unsuitable as highway units, and it may therefore be pointed out that the constitution of the county as the unit of rural highway administration is by no means an essential element of the kind of reorganisation which we are now contemplating. If the surveyor of each area, county or district, were, in the new organisation, given the grade appropriate to his actual position and responsibility, it would not be necessary to give the counties separate control over rural areas except in so far as the county surveyor would usually be the most conveniently located senior officer.

Special attention may be directed to our report of the remarks made by Mr. Frank Harris, whose wholesome and timely contribution to the discussion shows, we trust, that a stage has now been reached at which it will be possible for rural and county surveyors to identify their interests in order that the new organisation may be as satisfactory as possible to highway surveyors generally. A consideration which points to the advantage of a general superior control was suggested by Mr. H. J. Clarkson's account of an incident on the borders of four counties; and it may be pointed out, in support of the view expressed by Mr. R. Oakden, that the boundary line between adjacent areas of road administration, counties, or districts is often so situated that road work over considerable areas is divided among different staffs just where, owing to natural conditions, it should be carried out by a single department for the sake of economy. Mr. Montagu Harris's thoughtful contribution to the discussion seemed to create a very good impression, and Mr. E. P. Hooley remarked later that if road surveyors were to throw in their lot with the County Councils Association they might do much to solve their difficulties. As a whole, the discussion provided very satisfactory evidence that the relations between county and district surveyors are far more cordial than they were quite a short time ago. We have persistently worked to bring about such an understanding, and we trust that good relations may be so developed that the establishment of an effective organisation without undue predominance of central control may be happily consummated.

Economies In Road Construction.

Mr. Francis Wood's contributions to the subject of road construction and maintenance are always welcome. Some excellent points were made in the paper which he read at the annual meeting of the Institution of Municipal and County Engineers, and the reader of our report on this paper and the discussion which followed it will not fail to observe that in several matters precise knowledge of the behaviour of road materials seems to have advanced quite definitely in the past twelve months. Mr. Wood's paper is one which does not lend itself to brief and illuminating comment, but attention may be directed to individual points of especial importance. In view of the steady increase in the price of certain bituminous materials, it is interesting to note that the price of timber used for wood paving in the London area has also increased by about 20 per cent within the past few years. As regards theory, a passage in Mr. Wood's paper in which asphalt and macadam surfaces are compared with respect to resistance to traction must be mentioned on account of the possibility that it might be misconstrued by our younger readers. The conclusion that on certain assumptions an asphalt surface is better than macadam in the proportion of four to one, "so far as traffic is concerned," must be taken strictly within limitations. Tractive resistance is only one element, and, especially in city streets, another very important element is the efficiency of the paving as regards the rapid starting and stopping of vehicles. Another point which should not escape notice is that, in considering the behaviour of asphalt as regards dry slipperiness and wet slipperiness, Mr. Wood fails to point out that under some weather conditions hard and impervious surfaces are damp when softer and more porous surfaces are practically dry; or the hard surface may be wet when other surfaces are only damp. This consideration does not in the least detract from the force of Mr. Wood's remarks, but it is one which has to be reckoned with as a factor in road maintenance.

One of the most important of the considerations raised in this paper is that the limitation of grade to one in forty applies to certain bituminous compositions which resemble very closely those which have lately been advocated by several surveyors and others as suitable for country roads. It is not suggested that these surfaces will be laid in places for which they are unsuitable, nor is it intended to convey the idea that they cannot be so made as to provide a good hold on grades steeper than one in forty or one in thirty-five; but the limitations of surfaces of this kind in undulating or hilly country must be faced, and the more so that under modern conditions of haulage it will seldom be economical to reconstruct roads with much easier gradients. It is cheaper to climb up the hills and to coast down them without using power.

* * *

Pure Water and Health Statistics.

It is doubtful whether we yet have a true grasp of the relative importance and value of pure water. It is not to be doubted that the contradictory teachings of the scientific investigator leave us in a state of doubt. The bacteriologist, in particular, is very indefinite, and after an exhaustive study of the opinions of various authorities it is by no means clear whether any water can be said to be unsafe for drinking purposes unless certain well-known disease producing germs are actually known to be present. We are told that even sewage-polluted water is not necessarily harmful. It seems that even if typhoid organisms exist they tend to disappear rapidly with a few days' storage; in fact, from one point of view it seems to be quite extraordinary that even a badly polluted water should have any marked effect upon the death-rate, seeing that even if the disease germs are consumed by an ordinary person, that person probably possesses in himself powers of resistance that will safeguard him from the ill effects that might ordinarily be expected. We are told that there are many other causes for typhoid, and that water is not the only cause. On the other hand there are those who tell us that the coli are themselves capable of producing disease, that it is practically impossible to obtain pure water in a natural state. The possibilities of accidental specific pollution of the present supply are shown to be great and serious. We are assured not only that typhoid is caused by polluted water, but that the general health of the district is affected in other ways. Under these circumstances we fall back upon common sense, and use a water or purify it to such a degree as may seem to be reasonable, without having any fixed standard to go upon. Without any very clear reason it is generally accepted that such and such a water is good enough. The coli figures may be comparatively high, the filtering arrangements may be poor, the storage may be insufficient, but we have a death-rate somewhat lower than that of some of the great towns, and we take this as sufficient evidence that it would be extravagant or unnecessary to adopt methods which would undoubtedly produce water of greater purity.

Following this common-sense reasoning, it is interesting to read the statistics from America showing what has happened in eight cities since hypochlorite treatment of the water has been adopted. These figures appear in the *Engineering Record* of New York, and are quoted from a paper read by Mr. C. A. Jennings before the Illinois Water Supply Association, which is referred to more fully elsewhere in these pages. Of the eight cities, the maximum reduction in the typhoid fever death-rate was 72 per cent in Cleveland and the minimum 35 per cent in Baltimore. The average was 51 per cent. These figures clearly show that hundreds of valuable lives have been saved since the water was sterilised, but for every death from typhoid there must surely be a number of cases where the patients recovered. The actual number of persons who have been saved from having this terrible sickness is unknown. Here there is common-sense evidence of the value of sterilisation. Is it sufficient to acquiesce in allowing the death and disease rate to stand at a figure which might be reduced merely because it is low? It seems rather that common sense would dictate that every possible step should be taken to make water absolutely pure. What sacrifice would be too great to prevent the case of sickness or death which comes near home?

* * *

The Sanitary Institute at Blackpool.

The twenty ninth annual congress of the Royal Sanitary Institute, which concludes tomorrow, has been made the occasion of the usual conferences of the several classes of public officials who are concerned with various phases of public health administration. The close connection which necessarily exists between the ordinary daily work of the municipal engineer and surveyor and the practical application of sanitary science to the solution of many problems affecting the public health hardly needs to be pointed out. At all events, the inclusion of a conference of engineers and surveyors to county and other sanitary authorities in the programme of the Blackpool Congress will, no doubt, be regarded as a thoroughly appropriate feature of the proceedings. This conference was presided over by Mr. J. S. Brodie, M.INST.C.E., the borough

engineer of Blackpool, who, in opening the proceedings, shortly reviewed the progress of municipal engineering in its relation to sanitary science during the past twelve months. Starting with a brief reference to highway engineering, Mr. Brodie recalled two of the conclusions arrived at by the Third International Road Congress which was held in London last year. These had reference respectively to the selection of hygienic bituminous binders and the precautions to be taken in order to remove any objection to wood paving from a sanitary point of view. Dealing next with housing and town planning, the president of the conference reviewed the progress which has been made since the passing of the Act of 1909, and alluded favourably to the recently issued amended town planning procedure regulations by which the preliminary work, especially in the preparation of maps, has been simplified without sacrificing any necessary safeguards. Turning to the question of water supply, we are glad to observe that Mr. Brodie had something to say in regard to the desirability of dealing with public water supplies as a whole, instead of each community rushing to be first in the field to secure its own particular requirements. This question is one upon which we have frequently expressed our views, and we welcome every indication of the formation of a strong expert and public opinion on the subject. As regards sewerage and sewage disposal, too, increased efficiency and decreased cost could often be secured by co-operation between neighbouring authorities, as in the recent instance of Rochester and Chatham. The last subject upon which Mr. Brodie touched was the very difficult one of municipal labour unrest. An excellent address concluded with a vision of the future, when the labours of sanitarians shall be crowned by the attainment of health and happiness by every member of the community.

* * *

Housing the Labouring Classes.

It was an excellent idea of the proprietors of *Concrete and Constructional Engineering* to offer a number of prizes varying in value from 100 to 10 guineas for designs of small cottages suitable for rural districts, the cost of which was not to exceed £125 each, exclusive of builder's profits. The result has been that no fewer than 249 designs have been submitted by architects and others. The designs are on exhibition this week in the Lecture Hall of the Surveyors' Institution, 12 Great George-street, Westminster, S.W., and are well worth inspection.

It would be impossible to give even the barest description of the numerous designs, which are well hung on screens; suffice it to say that they all contain the following accommodation: Small entrance hall, kitchen living-room, three bedrooms, scullery, larder, water-closet, and fuel store. A large number of them are only one-story buildings, and, of course, they are all, more or less, constructed of concrete. The first prize of £105 has, as stated elsewhere in this issue, been awarded to Mr. Ernest S. Thompson, a Westminster architect, who has strictly adhered to concrete throughout. His design has many novelties, and is of a bungalow type with a flat projecting roof of reinforced concrete. The interior arrangements have been well designed to prevent any waste of domestic labour, and seems to meet all the requirements of a cheap, substantial, attractive cottage. It would be a worthy enterprise if someone would erect a few cottages of this type, and possibly others from the chosen designs, in order to see if they could be erected at the price, and also to ascertain, if possible, the class of cottage which would be most popular among the labouring classes. The proprietors of *Concrete and Constructional Engineering* are to be warmly congratulated on their enterprise in having initiated this competition on lines which are so thoroughly practical and so devoid of the usual sentimental theorising which is too often adopted when dealing with this difficult and complicated problem.

* * *

Housing at Merthyr.

The housing problem with all its characteristic features has had to be faced by the Merthyr Corporation for some years past, very largely owing to the necessity which has existed for clearing away tenements of the hovel type. Here, as elsewhere, the absurdity of a policy of mere demolition without the provision of decent dwellings as substitutes for those pulled down has had to be recognised. Private enterprise has failed to meet the needs of the population to an adequate degree, and consequently the corporation have been obliged from time to time to undertake the erection of municipal cottages. And here they have found themselves up against the problem of the economic rent. The 300 houses which have so far been erected are let at such a rent as makes the income which they produce commensurate with the outlay involved. It has now become necessary, however, to proceed with a new scheme, and it has been decided to erect an additional 88 houses in order to meet the needs of people who are at present living in insanitary dwellings. A calculation by the borough architect has shown that, comparing the cost and the weekly rentals, on an average for every £3 of capital expenditure the weekly rent is 1d. On this basis it is probable that the weekly rent of the new dwellings will have to be fixed at the rather high figure of 6s. 9d., and some apprehension has been felt as to the view which will be taken by the Local Government Board of so comparatively large a rental. It has been decided, therefore, that for every £3 which can be saved on each house by economies, the rent is to be reduced by 1d. a week. Here is a great incentive to the committee and their architect, and it will be interesting to see whether it results in the application of any novel ideas of construction which may prove a good example for others to follow.

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"Pestering" the Redruth Surveyor.

"Pestering the Surveyor" is the heading which the *Western Daily Mercury* gives to a report recently of the proceedings at the Redruth Urban District Council, and the phrase is quite typical of what many municipal engineers have to contend with in the daily discharge of their duties. In this particular instance the pestering assumed the familiar form of blaming the surveyor without due cause—without, indeed, any cause whatsoever, seeing that the official was acting according to instructions received. The expenditure was stated to have increased £20 a fortnight, and this was characterised by a councillor as a most serious thing. The surveyor explained that an extra amount of stones was being broken, and that some tar-spraying was being done, and the chairman of the Finance Committee added that extra men were being employed. "You want work done," he said, "and that means you will have to increase the staff. The employment of men means money." Anything more obvious than this it would be impossible to imagine, yet to the mind of one doubting councillor it made only a vain appeal. "You are always pestering the surveyor," exclaimed another councillor in a forcible sentence, "to go on with this and that job, and while that kind of thing continues the wages are bound to go up." This declaration epitomises the hardship of a position whose exacting conditions are too often requited by undeserved censure.

Some Notes on Highway Law as Affecting the Municipal Engineer.*

By SYDNEY G. TURNER, A.M.INST.C.E., Barrister-at-Law.

After dealing with the subject historically, Mr Turner went on to deal with

THE REPAIR OF HIGHWAYS.

The following notes are based upon the chapter on Highways in the author's work on "Public Health Law," and on the article contributed by him to "Practical Road Engineering," edited by Mr. H. Percy Boulnois, M.INST.C.E., &c.

It does not follow that because a road is dedicated to the public and becomes a highway, the highway authority are liable for its repair and maintenance.

Mr. Sydney G. Turner.

Prior to the passing of the Highway Act, 1835, no distinct Act of adoption was necessary in order to make a parish liable to repair a public road; if the road was dedicated to and accepted by the public the parish was at common law *primâ facie* bound to repair (*Rex* v. *The Inhabitants of Leake*, 1833, 5 B. and Ad., 469). Since 1835, however, some formal Act of adoption has been required before a highway authority becomes liable for the repair of a new highway. This form of adoption may take place in either of three ways—viz.: (*a*) The formalities prescribed by sec. 23 of the Highway Act, 1835, may be observed; (*b*) a highway may be adopted by notice declaring it to be a highway repairable by the inhabitants at large, under sec. 152 of the Public Health Act, 1875, or sec. 41 of the Public Health Acts Amendment Act, 1890, in districts in which that section is in force; (*c*) a highway may be adopted by notice under sec. 19 of the Private Street Works Act, 1892, in districts in which that Act is in force. In the case of a highway dedicated since 1835 there is no liability on the part of the highway authority to repair unless one of these three courses of procedure has been followed (*Eyre* v. *New Forest Highway Board*, 1892, 56 J.P., 517).

Apart from the appropriate remedies for any default in the execution of their statutory duty, a highway authority will not be held liable for a mere omission to repair (*Cowley* v. *Newmarket Local Board*, 1892, A.C., 345), although they are liable for any injury or damage caused by any act done by them on a highway (*Hill* v. *Tottenham Urban District Council*, 1898, 79 L.T., 495). As regards the manner of repair, some interesting cases have been decided in recent years. The leading case is *West* v. *Bristol Tramways Company*, 1908, 2 K.B., 14, where the plaintiff, a market gardener, successfully claimed damages for injury to plants and flowers caused by the fumes emanating from creosoted wood paving. The case was decided on the ground that the defendants had no statutory authority to use creosoted wood, but that their only statutory obligation was to pave, and a material which would not have caused damage might have been used. In these circumstances, having elected to use creosoted wood, they did so at their peril, and having exercised their statutory powers negligently, they were held liable for the damage caused. The principle of this case has since been applied in a case against the Kent County Council (decided in the County Courts, where a cow was killed through drinking water which had been polluted by tar washed from road surfaces. In this case, as in the Bristol case, it was held that the treatment of the road with tar was not the only method available, and was not, therefore, absolutely necessary for carrying out the duties laid by statute upon the council. Two other cases may, perhaps, here be noted. The first was tried in the Swansea County Court, and damages were recovered against the Glamorganshire County Council, who had omitted to warn the public of extensive tar-spreading operations which were in progress. In the other case, which arose in Ireland, a cyclist recovered damages against an urban district council for injuries received owing to the slipperiness of a highway which had not been sanded after tarring.

By the Local Government Act, 1888, the duty of repairing main roads is cast primarily upon the county councils. By sec. 13 of the Highways and Locomotives (Amendment) Act, 1878, any road which has, within the period between December 31, 1870, and August 16, 1878, ceased to be a turnpike road, and any road which being on August 16, 1878, a turnpike road, may afterwards cease to be such, shall be deemed to be a main road. The same Act contains provisions by which any highway which in the view of a highway authority ought to become a main road, by reason of its being a medium of communication between great towns, or a thoroughfare to a railway station, or otherwise, may be declared to be a main road by an order of the county council made on the application of such highway authority. Before this order becomes operative, however, the road must be put in proper repair and condition to the satisfaction of the county council (Local Government Board Act, 1888, sec. 11 [7]). Further, a main road may lose its status as such, by an order of the Local Government Board made on the application of a county council. Sec. 11 (1) of the Local Government Act, 1888, enacts that main roads shall be wholly maintained and repaired by the council of the county in which they are situate, and such council, for the purpose of the maintenance, repair, improvement, and enlargement of, and other dealing with such road, shall have the same powers, and be subject to the same duties, as a highway board.

Several cases have arisen as to what is included in the term "maintenance" as applied to a main road. It has been held to include the removal of an obstruction—*e.g.*, snow which renders a road impassable (*Guardians of Amesbury Union* v. *Wiltshire*, JJ., 1883, 10 Q.B.D., 480); scavenging and watering in so far as they are necessary for keeping a road in repair, but not when merely done for the purpose of enabling passengers to use a road with greater comfort (*Mayor, &c., of Burnley* v. *Lancashire County Council*, 1889, 54 J.P., 279); it is submitted that this decision would be equally applicable to any form of surface treatment. On the other hand, "maintenance" does not include lighting; nor does it include the conversion of a macadamised road into a paved road (*Leek Improvement Commissioners* v. *Staffordshire*, JJ., 1888, 20 Q.B.D., 794). It is submitted, however, that works of this character, and also the substitution of a waterproof for a water-bound road would be included in "improvement of" or "other dealing with" a road under sec. 11 (1) of the Local Government Act, 1888. The particular works which may be executed for the purpose of maintenance, repair, &c., under this sub-section are in the discretion of the county council, a discretion with which the Courts will not interfere unless it is proved that it is not being exercised in

* Paper read at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham.

good faith (*Mayor &c. of Wednesbury v. Lord Hatherley Colliery Company, Limited*, 1907, 1 K.B., 78).

The Local Government Act, 1888, contains provisions for the maintenance of main roads by urban authorities either at their own expense, the county council paying a contribution to the cost, or by contract with the county council. The powers and duties of an urban authority in regard to such main roads are generally similar to those in regard to the roads vested in them. The county council are not necessarily liable for the whole amount required in respect of repair and maintenance, although in certain cases they may be. In default of agreement the amount must be determined by the Local Government Board (*In re Inglewhite County Council v. Bedford Urban Sanitary Authority*, 1894, 2 Q.B., 786). When the cost of improvements has been determined by an urban authority, not out of current rates, but out of a loan, the amount of such costs for the purposes of the loan ought to be made by the county council should be ascertained, not with reference to the total amount of the loan, or so much thereof as has been expended within the year upon such costs, but with reference to the amount of the instalments which the urban authority has to repay during the year, or the sum which it pays into a sinking fund during the year, for the purpose of discharging such loan, as the case may be (*Mayor &c. of Wednesbury v. Wednesbury County Council*, 1894, 58 J.P., 243). The annual payment to be made by the county council must be in respect of the actual expenditure of the particular year, and not a fixed sum to be arrived at by taking the average expenditure over a series of years (*Sandgate Urban District Council v. Kent County Council*, 1898, 79 L.T., 125).

EXTRAORDINARY TRAFFIC.

"Extraordinary traffic" is a technical term which includes all such continuous or repeated user of the road by a person's vehicles as is out of the common order of traffic, and as may be calculated to damage the highway and increase the expenditure on its repair (*Hill v. Thomas*, 1898, 2 Q.B., at p. 340). It is really a carriage of articles over the road, at either one or more times, which is so exceptional in the quality or quantity of articles carried, or in the mode or time of user of the road, as substantially to alter and increase the burden imposed by ordinary traffic on the road, and to cause damage and expense thereby beyond what is contemplated. "Extraordinary traffic" was first dealt with in the Locomotive Act, 1861, by way of prohibition. This was, however, repealed by the Locomotive Act, 1865, and since that date the object of the Legislature has not been to prohibit the traffic but to secure to highway authorities the right to recover expenses incurred by them in the repair of roads damaged by it. The matter is now governed by sec. 23 of the Highways and Locomotives (Amendment) Act, 1878, as amended by sec. 12 of the Locomotives Act, 1898, the provisions of which have given rise to an enormous amount of litigation. In the article which he contributed to "Practical Road Engineering," the author ventured to predict that questions would arise as to the liability for injury to the surface of roads—and particularly of newly waterproofed surfaces—caused by non-skidding devices attached to the wheels and tyres of traction engines and motor cars, and he then pointed out that, although the rules laid down by the Court of Appeal in *Hill v. Thomas* (*supra*) might be extended to apply to such cases, it must be remembered that that case was decided in 1898, and that the Court had not in their minds the changed conditions of to-day. Another question is now to the front. The spread of the operations of the motor omnibus is playing havoc with many a macadamised road, and some authorities appear to have taken the view that motor-omnibus traffic is "extraordinary traffic," and that consequently they can recover the cost of repairing the roads from the companies concerned. The matter is a novel one, but it is submitted that this view is wrong. The following observations of Mr. Justice Wills in *Hemsworth Rural District Council v. Micklethwaite*, 1904, 68 J.P., 345, appear to be applicable to the cases both of the non-skidding devices and of the motor omnibus: "Traffic must of necessity, as time goes on, vary in its character according to the development of the various industries in the neighbourhood, and traffic which in one year or at one given time may be extraordinary traffic will, in the course of time—and it may be in the course of a comparatively short time—become ordinary traffic. Therefore, I think that, in considering whether traffic is extraordinary or not, it is not sufficient to take simply the year to which the question relates and compare other traffic on the road during that year with the traffic complained of. That would be a fallacious test. The test is, whether the particular traffic in question has, by the usage of trade and of society, and by the varying circumstances applicable to the case, by that time become such as can fairly be called ordinary traffic."

In order to afford definite basis for discussion, Mr. Turner, in conclusion, quoted some suggestions for reform made by Mr. and Mrs. Sidney Webb.

THE RESULTS OF HYPOCHLORITE TREATMENT OF WATER.

In a paper read before the Illinois Water Supply Association by Mr. C. A. Jennings, which is quoted in the *Engineering Record* of New York, it is shown that 600 cities in the United States are using hypochlorite for water sterilisation. It is further shown that no city following a proper procedure has found it necessary to discontinue its use. Where poorly designed plant and improper working have led to trouble the method has, however, fallen into undeserved disrepute. It has sometimes been assumed that the application of hypochlorite would remedy a condition quite outside the sphere of its usefulness.

Statistics were quoted in this paper showing the results obtained at eight American cities where hypochlorite sterilisation has been adopted. In the eight cities the maximum reduction in the typhoid death-rate was 72 per cent at Cleveland and the minimum 35 per cent in Baltimore. The average reduction was 51 per cent. The total population considered was 2,033,000, with a reduction per 100,000 population for each year of 15·8 deaths.

At Baltimore, hypochlorite treatment of the water was started in June, 1911. Here the death-rate from typhoid fever was 35·2 per 100,000; during the period from 1900 to 1910 this death-rate fell to 22·8 per 100,000 in 1912-1913 after using hypochlorite. At Cleveland, where the treatment started in September, 1911, the death-rate fell from 35·5 during the preceding ten years to 10·0. At Des Moines the treatment was started in December, 1910. Here the death-rate fell from 22·7 during the preceding five years to 13·4. At Erie the treatment was started in March, 1911. The death-rate in this case fell from 38·7 in the preceding ten years to 13·5. At Evanston, where the treatment was started in December, 1911, the death-rate fell from 26·0 during the preceding three years to 14·5. In Jersey City the treatment was started in September, 1908, and the death-rate, which was 18·7 during the preceding seven years, fell to 9·4. At Kansas City the treatment was started in January, 1911, and the death-rate fell from 42·5 during the preceding ten years to 20·0. At Omaha the treatment was started in May, 1910, and the death-rate, which was 22·5 from 1900 to 1909, fell to 11·8. Such are the beneficial results of water sterilisation in America.

RESIGNATION OF THE BOROUGH SURVEYOR OF GUILDFORD.

Mr. C. G. Mason, who has been borough surveyor of Guildford for eighteen years, tendered his resignation to the town council last week. The matter was taken in committee, and the following communication was made officially to the Press: "The borough surveyor tendered his resignation to the council, and at the same time thanked the council for the invariable kindness with which he had been treated during the last eighteen years. The council accepted the resignation and appointed a special committee to bring up a report as to the terms of appointment of his successor."

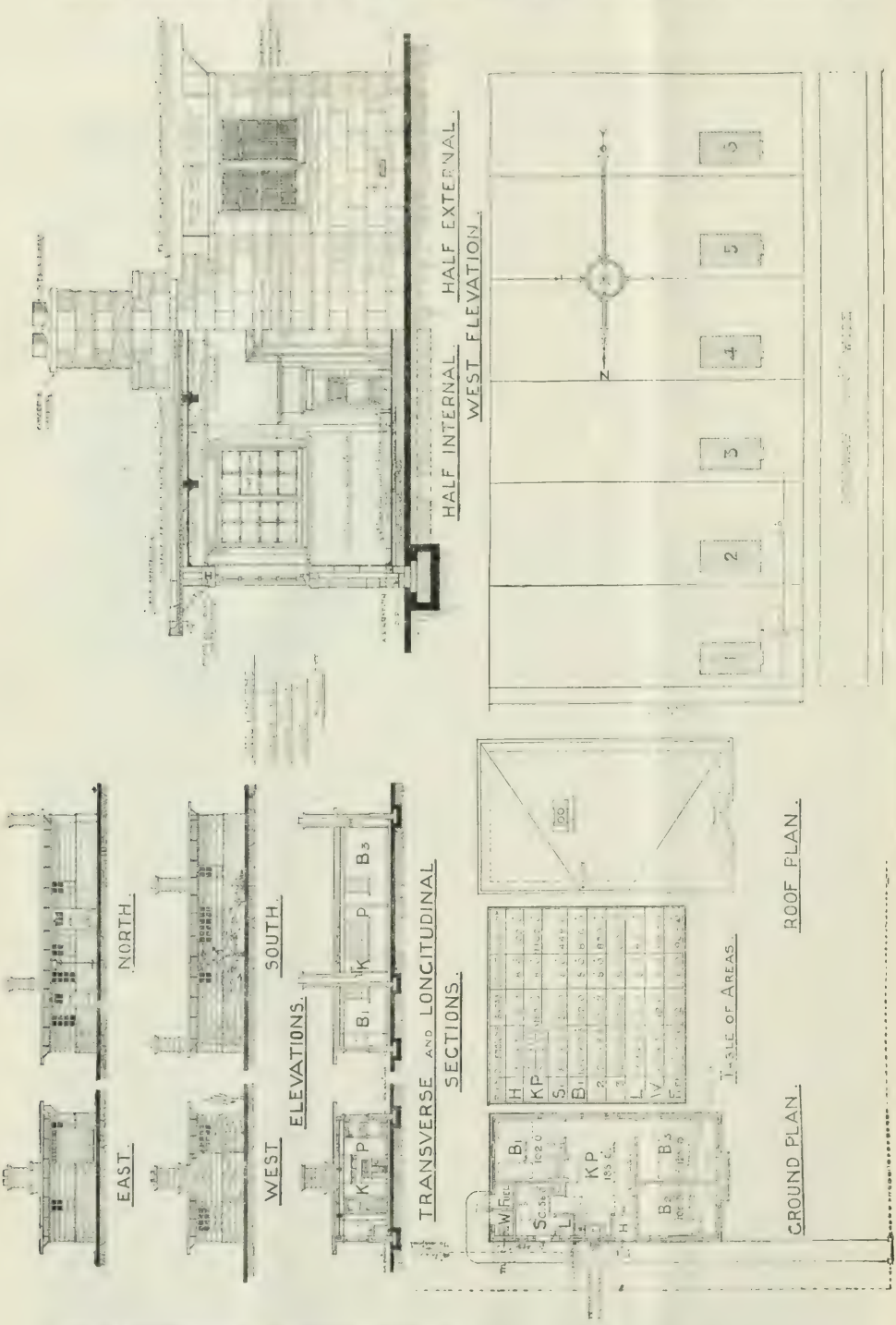
It is understood that the resignation took effect immediately.

Mr. Mason was in his early days articled to the borough engineer of Portsmouth, and subsequently he filled various positions on the staff of the then borough engineer, Mr. H. Percy Boulnois, M.INST.C.E., finally becoming highway surveyor. He obtained his Guildford appointment in 1896. Mr. Mason is an associate member of the Institution of Civil Engineers, and also a member of the Institution of Municipal and County Engineers.

£125 CONCRETE COTTAGE COMPETITION.

The principal feature of the July number of Concrete and Constructional Engineering is the announcement of the result of the £125 Concrete Cottage Competition. The assessors, in their report, express their satisfaction with the number and general character of the designs which show the interest taken in the simple, but important, economic problem of cheap cottage building. Two hundred and forty-nine drawings were received.

The first prize of 100 guineas was awarded to Mr. Ernest S. Thompson, architect, 5 Victoria-street, Westminster, S.W.; the second prize of 50 guineas to Mr. Chas. Bulman Pearson, Licentiate R.I.B.A., of



£125 CONCRETE COTTAGE: FIRST PRIZE DESIGN
(Mr. Ernest S. Thompson, *Architect.*)

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109 Harley-rd, Chiswick, W.; the third prize of 20 guineas to Mr. Harold G. Holt, A.R.I.B.A., 11 Probyn-road, Wallasey, Cheshire; and the fourth and fifth prizes of 10 guineas each to Messrs. Leonard G. Hammond, 42 Rock Park, Rock Ferry, Cheshire, and M. Crosnier, 20 Brechin-place, South Kensington. Two consolation prizes of 5 guineas were also awarded to Messrs. J. Cooper & T. Hill, 20 Stanmore-buildings, Stamford New-road, Altrincham, and F. W. Stubbs, A.R.I.B.A., Grayshott, Marlborough-road, South Croydon.

The assessors were Mr. Max Clarke, F.R.I.B.A., Prof. Beresford Pite, F.R.I.B.A., and Mr. Edwin O. Sachs, F.R.S.E.

The entire drawings sent in will be exhibited at the Surveyors' Institution (lecture hall), 12 Great George-street, Westminster, S.W., July 6th to 11th, inclusive, 11 a.m. to 6 p.m. daily.

ENGINEERING JOTTINGS.

VI. MUNICIPAL PLAYGROUNDS.

By Herbert G. Coales, Assoc.M.Inst.C.E., F.S.I.

The public school without good playing fields does not command the same popularity as one well equipped in that respect. To some extent it is the same with towns—people will generally give a good name to a town which has ample facilities for recreation and sport.

What is the duty of the local authority in the matter of the provision of parks, pleasure and recreation grounds? Where is the line to be drawn? If one set of people has cricket pitches provided for it, should another—richer, perhaps—have a polo ground assigned? Likewise, if a class of citizen prefers to take his rate-provided amusements on land, would another class be justified in asking for equal facilities on water? It is not difficult to draw the line for most of the civic services; but in catering for recreation it is easy to see that a town might be lavish or niggardly, and in either case might at the same time be unfair and partial.

Playgrounds are places where games can be played, and the ordinary open space or ornamental enclosure is not the subject of this note. Of course, towns must have lungs, but most people are not satisfied with just breathing—they want exercise, violent or otherwise.

It has been reported that Berlin has recently decided to purchase from the Prussian Government 27,000 acres of forest land situated in the immediate neighbourhood of the city. The price to be paid is about £2,500,000 sterling. The transaction is the outcome of a movement in favour of surrounding all large towns with an inviolable "girdle of woods and meadows." What a delicious prospect the news opens out! A poor old woman, seeing the sea for the first time, exclaimed: "Thank God I've seen something there's enough of!" Surely the German townsman will be satisfied with the purchase of land on such a scale!

English cities, having acquired large tracts of land around their borders, would be able to cater for the recreation of their people if they so decided. So far Parliament has discouraged speculation in land by municipalities; but a change is due, and no doubt more progress will be made in the future in this direction. It may be socialistic in effect, but, as a late Chancellor of the Exchequer observed, "we are all socialists nowadays." By charges and tolls it is possible for the municipality to make its adult citizens pay towards the upkeep of well-kept lawns or greens, and the provision of artificial lakes. In this case the arrangement would seem to be fair. The golfers and bowlers would pay a green fee, the rowing people would be charged for their boats, and the tennis players for their courts. The old gentleman who takes his recreation in his easy chair at home would have the satisfaction of knowing that the people who "wasted" their time in playing games were being made to pay something. Unless payment were exacted, and the court or green reserved, players would not get much enjoyment out of publicly provided facilities for tennis or golf, for children and others would overrun the place, and all balls would be quickly confiscated.

In time, the provision of plenty of playing fields would lead more people to exercise themselves instead of merely watching others—many of whom are paid to play. At the present moment, no two rival towns would dream of playing off a match on a public recreation ground where they could not take gate money. So games must be treated not only in the interests of sport, but for the sake of the takings.

When one begins to schedule out a list of games and recreations for which a town might legitimately make public provision, an old-fashioned man wonders what the world is coming to, for it would contain every outdoor pastime, with the exception, possibly, of fox hunting, horse racing, and bull fighting. The law being adapted to the new order of things, power would be given to the local authority to develop and utilise its big land purchases in the most sensible and far-seeing way. Ample sites could be reserved for future building operations, and it would not be necessary to hold the municipal golf course sacrosanct for ever. The greens could gradually be pushed further out as the bricks and mortar advanced. Judicious laying out and management of the bought-up land would prevent intolerable burdens being cast upon the ratepayers. The engineer would plan out the roads for the future development of the property; but only present requirements would be met, and many of the streets would be merely on paper. The artificial lake would be contoured out and constructed (if a natural one were absent), and would serve for skating in the winter as well as for boating in the summer. The poorest of the land would be set apart for the golf links, and the best turf could be used for the tennis courts and the bowling greens. The boy scouts would be given a clearing in the wood for their camp, and the rifle range would be on the outskirts of the property.

The provision and laying out of the extensive municipal playground in the future, therefore, may be a very important part of the town engineer's duties. When people have got accustomed to the idea of publicly provided facilities for sport, they would ask the governing body to buy land for that purpose and lay it out, and, after all, it will not be such a very long step from the recreation grounds we know to the more extended playing grounds with the more ambitious list of games to be catered for. Nor must it be forgotten that any argument against a public golf course or a tennis court applies equally against public bands, public baths and public libraries.

Very few people can own to have the run of private parks or water, and only by corporate means can facilities be given the ordinary town inhabitant for the enjoyment of "woods and meadows" to the fullest extent. Indeed, few Britishers enjoy the open air to the fullest extent without participating in games.

Coast Sand Dunes, Sand Spits, and Sand Wastes. (By Gerald O. Case. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. 5s. nett.)—While a good deal of attention has been directed in recent years to the question of coast erosion, but little has been said of the changes made by the wind on sandy shores. . . . The subject is certainly of sufficient importance to deserve more attention than it has hitherto received, and in discussing the nature of the groynes, embankments, &c., as well as of the vegetation best suited to arrest the movements of sand, Mr. Case has made distinct progress towards the solution of a difficult problem.—*Journal of the Society of Arts.*

Tar Grouting in Perthshire.—In his report for the year ended May 15th last, Mr. W. L. Gibson, surveyor for the Western District of the Perthshire County Council, says he is still of opinion that the tar-grouting system is the most efficacious for the maintenance of main roads in this district. It is now over six years since the first length of this method of construction was laid on the Great North Road. During that period it has only been once tar-painted at a cost of 1½d. per super. yard; and at present, although the surface is showing signs of disintegration, its construction generally appears as if it would last for at least another season or two if the surface is again tar-painted. "All the other lengths since laid down, which have been carried out under grants from the Road Board, are also," Mr. Gibson adds, "showing good results, and although it still seems quite impossible at present to reconcile the wishes of horse and motor users alike in the matter of surface, the tar-grouting system goes a long way towards meeting the wishes of both. The tar-painting of the surfaces helps greatly to prolong the life of the metal bed and to minimise the dust nuisance; where this system of maintenance is adopted on roads where mechanically propelled traffic exists the economy in the saving of road maintenance must be considerable."

Institution of Municipal and County Engineers.

ANNUAL MEETING AND HOUSING AND TOWN PLANNING AND ROADS CONFERENCES AT CHELTENHAM—(3).

Continuing the proceedings in the Roads Section of the recent annual meeting of the Institution of Municipal and County Engineers—Mr. H. T. Wakeling, M.Inst.C.E., in the chair—the subjoined paper was submitted for discussion:

CONTROL, MANAGEMENT AND MAINTENANCE OF RURAL ROADS.

By J. Fred. Hawkins, M.Inst.C.E.,

The work in connection with the rural roads has been handicapped in the past by too many road authorities and a diversity of methods. It can fairly be taken that all will be unanimous in the opinion that the more any area or system is split up the less is the [illegible] control resulting. The smaller the authority the less the salaries, and the less the likelihood of obtaining well-qualified men to fill appointments. The smaller the authority the less the chance of public men of ability and position taking their share of duty to their country.

To-day with the rural roads it can be shown in counties that the work now split up into small areas is not so well or efficiently carried out as in the old large rural area days. If this is a fact, it surely goes far to prove that a larger authority, such as a county council with an efficient staff, could manage a combined country area better than groups of smaller areas practically carrying out work that should be managed by one central authority, and goes far to substantiate the old adage, "United we stand, divided we fall."

This is the more marked when one considers how altered everything is since the advent of self-propelled traffic. Nowadays it is not the country cart that has to be catered for, doing at the outside its 20 miles per day, but the ubiquitous motor or motor lorry that travels its 120 or 150 miles per day.

Fancy a car on a journey travelling through twenty different road areas in a day and the cost of the damage not being contributed towards in any one of those areas. If the whole area damaged could be placed under one rating authority, and the cost of repairs paid for by one, the general fairness would be apparent to all, and if the cost is found, why should not he who finds the money carry out the work.

It is not suggested that all small authorities neglect their roads. Many district councils are anxious to improve their roads, but, having so many calls to meet, have not the financial ability, with the result that many district roads are not as good as they were, the allowance for maintenance not keeping pace with the traffic.

A county unit having its members drawn from a much larger area would not be influenced to the same extent by the local element, and would be better able to deal with matters on a purely business basis without fear or favour.

At present there are over

650 RURAL ROAD AUTHORITIES,

each acting on its own sweet will! Why not reduce these to sixty in rural areas, and at the same time reduce the chance of our roads becoming like a patchwork quilt?

Smaller areas cannot but feel fluctuating rates. Take a rural district council where an increased estimate for improvements to roads of £300 would entail an increase of 6d. on the rates. What surveyor receiving a salary of £100 per annum would dare to bring such an estimate before his council even though he knew the roads badly needed the improvements, and saw that "the stitch in time would save nine"? It is feared that small authorities neglect their roads and stave off the day of reckoning as long as possible, eventually crying loudly for someone else to pay their deferred cost.

The Road Board, which was appointed in 1909, has certainly done excellent work in the short time it has been in existence. Without its grants to the trunk roads during the past few years many of them would have become impassable. But even the grants made at present by that board are not commensurate with the needs of the country, and if this is so for the county, how can the lesser areas efficiently grapple with the growing needs without even his assistance?

Under the Local Government Act of 1894 the roads that were not declared main roads were placed under the control of district councils. Latterly some of the district roads which took practically no traffic have through the advent of self-propelled vehicles become important channels of communication, and are now practically main roads. In some such cases the county council has been ready to take these roads over, but the district councils have not seen their way, in many cases owing to lack of funds, to make them up to the standard required for adoption, and they remain in a deplorable condition.

In the majority of cases this additional traffic has brought no equivalent local benefit in return for the extra money spent on the roads. The business of small local tradesmen in country districts is now swamped by the motor-van deliveries of goods from dealers in the large towns, so that they are actually the losers by the increased expense they are called upon to bear.

It would appear that most county councils are now alive to the growing needs of localities, and with the assistance and guidance of the Road Board they seem to be the natural authority for dealing with all such matters as road management.

The fact that it is recognised in the Royal Commission on Local Taxation, 1901 Report, that "The maintenance of main roads we also consider on the whole to be a national service and likely to become more so owing to the increasing mobility of the population and the development of new means of locomotion," goes far to show that the government is alive to the fact that certain charges should be eased from the direct ratepayer and the cost spread over as large an area as possible. If this is so for trunk roads, does it not point that local roads are now more than ever county charges and should be managed and paid for by a county authority? Those who have efficiently carried out a system of direct management on their main roads could without much trouble design and carry out a system for managing all roads in a county, and there is little doubt that all ratepayers would benefit by it. No doubt the carping critic, and possibly some of the well-paid and not over-worked officials, might object to such a body as their local authority being relieved of some of its duties, but common sense must show that their views are personal and narrow, rather than broad and wide as those of all efficient officers should be who have the real interest of the public at large at heart.

Public authorities are largely dependent on their expert advisers for submitting to them the most efficient and economical methods. It is therefore clear that for satisfactory administration a com-

petent and efficient staff is essential, and the contention that, should all roads be put under the jurisdiction of the county councils, a large number of district surveyors would be thrown out of work is disproved. No more false economy seems possible than the attempt to carry on an undertaking with an inefficient staff.

The suggestion in the recent Final Report of the Departmental Committee on Local Taxation, that roads should be divided into (*a*) Main roads, (*b*) county roads, (*c*) district roads, (*a*) to receive Exchequer grants of half the cost of maintenance and for further works of improvement, and (*b*) a quarter, seems hardly sufficient at present.

Since the Road Board came into existence the condition of roads has, of necessity, been greatly improved, and in order to bring their roads up to the necessary high standard set up for the first two classes of roads it is feared that rural councils will receive but little relief. The report goes on to say that "in many cases substantial improvements will be necessary before roads can be properly classed as main roads," and that "the expenditure on such improvements would appear to be a substantial object for grants from the Road Improvement Fund."

The Road Board distribute their grants to a certain extent on the basis of population, and on the whole this seems a fairly reasonable arrangement, but unfortunately the Board's funds are limited. Already occasion has arisen in some counties for large sums to be spent in such improvements as the putting in of foundations and drainage and for widening. Should a council have to spend, say, £60,000 on improvements necessary to bring their roads up to the required standard, and should their share of the improvement funds be only £20,000, the burden on the ratepayers remains a very considerable one, and it is for such reason that the author suggests larger exchequer grants should be given. The proposal to put all roads under the jurisdiction of the county council may possibly seem too drastic a measure to be taken all at once, but it certainly seems advisable that the first two classes of roads, as suggested in the report, should be under county administration.

At present, as very few district councils allow their surveyors either efficient clerical assistance or efficient means of locomotion, these officials have to spend a great deal of time doing clerical work, and are unable to give proper attention to superintending the work on the roads. There is no doubt that with more clerical assistance and reasonable travelling allowances district surveyors would be better able to cope with their outdoor work.

The writer does not put forward any present county scheme as ideal for the movement, but he suggests that the county council is the best unit for efficient road management, and is convinced that when rating is placed in the hands of those who have the actual spending, rather than delegated duties, the greatest benefit to all will result, and the sound well-being of the community will be best appreciated.

Statistics are an important feature in road-making. At present there are few authorities using the same forms. It would be a great help if the Road Board were charged with the standardisation of forms, the collecting and tabulating of all statistical information, and the distribution of it to all local authorities.

It is often said that the surveyors have but to execute their duties without interfering with such matters as law and finance; but if a surveyor did so confine himself to his so-called duties, it would appear to be a sorry day for his council, and in thus suggesting a possible improvement in rural government it is hoped the writer will not be thought to be overstepping his ordinary duties.

DISCUSSION ON MR. HAWKINS' PAPER.

Mr. Frank Harris (Tunbridge Wells) said, as one of the poor rural surveyors, he might inform them he had to walk there that morning, or rather had to come from the Plough. He read the paper on the way down from London, and his dander was somewhat raised. He said to himself: "Here is another county surveyor trying to boss the county, and will be trying to boss the universe directly." Fortunately, he met Mr. Hooley at breakfast that morning, and he put it in a different light. Mr. Hooley said, "You know Mr. Hawkins, don't you?" and he said, "No, I don't." Mr. Hooley then said: "He's a very decent sort of man." They went through the paper together, and he said: "I think the paper has been written in the wrong tone," and Mr. Hooley disagreed with him. Like Balaam, he came to curse, but he might stay to bless, and after hearing what Mr. Hooley had to say, he had to admit there might be something in it. This question was raised at the Roads Congress, and the opinion was expressed that that was not the place to discuss it. It was an argumentative paper. It was not a question of construction, it was a question which affected their own livelihood. It was a personal paper, and to such so questioned it that was the proper place to discuss it; and yet, in his own mind, he knew of no other place where it could be better done. On the question of controlling the roads, he admitted that the county surveyor could do this, as he had very little to do. He, however, disagreed with Mr. Hawkins when he said that those rich rural surveyors had very little work to do. He did not know any highway surveyor, whether in a rich or poor district, who had not plenty to do. If he was not actually at work he was trying to find out something to meet the present conditions. If there was to be county control, the county would have to finance the business. That he looked upon as a step in the right direction. He knew rural districts in Kent, and probably they were as rich there as any other part of the country; and, by the way, the rural surveyors were petitioning the county council for assistance for roads. A surveyor said to him the other day that a motor 'bus service of fifty 'buses a day had been inaugurated along 3 miles of one of his roads, and a penny rate brought in £160. They would understand how far a penny rate would go on those 3 miles with £160. The expenditure on that road was prohibitive, so far as the district was concerned. That made him think there was something in the county council taking over and financing the maintenance of rural district roads. He appreciated that Mr. Hawkins was not antagonistic to the rural surveyor. He had been brought into contact with a good many county surveyors, and found them all very reasonable men. The rural men had got the feeling that they did want to gobble them up. He appreciated what Mr. Hawkins had said that he had no such intention. There was no finality in this meeting on this question. He would like to see this further discussed, and, if possible, some scheme adopted. Mr. Hawkins' paper was a general one, and there was no scheme in it at all, and he did not know what would be done with it, whether it would go to the council of the institution or to the Road Board.

Mr. H. J. Clarson (Tamworth) said that his experience of county surveyors was not on a par with the last speaker. He had had a good deal to do with the county surveyors of Warwickshire and Staffordshire. In one instance—he would not tell them which—he had always been treated in the fairest possible manner, and in the other he had not. He had under his control 200 miles of roads, a good portion of which ought to be main roads. For his part, he thought it would be a good thing if some of the up-to-date rural authorities were to gobble up some of the antiquated county roads. His roads were in a far better condition than the roads of the county surveyor whose name he had not mentioned. Those roads, notwithstanding that they were in a better condition, cost less than one-fifth of the county roads, though in fairness he must say that in some instances they were not so wide. Recently a good deal of 'bus traffic had been largely diverted from the main county roads to his roads, and he did not like that, because it meant an increase in the cost of his roads. He did think if they got that friendly feeling extended to them which he got extended by that one county surveyor, they would be able to work more amicably, and the work would be carried on better than it was, not only to the advantage of the rural surveyor, but to the community at large. He had a road which was within 50 yds. of four county boundaries. He drove over there the other day, and he found four county rollers and his own roller at work within a space of half a mile. If that tended to economy he did not know what it was. If the four county councils had conferred together and hired his roller, he should have been pleased to let it at a considerable profit, and the work would have been done as well and certainly more economically.

Mr. Montagu Harris (County Councils Association) raised the question whether this was the proper place to discuss the points which Mr. Hawkins put forward, but he would venture to hope that either

[illegible] would be [illegible] [illegible] [illegible]

better if all the first and second class roads were administered by the county authority, but he could hardly in other cases where the present system should continue. It might be argued that he was halting between two methods. He was satisfied from his experience in Gloucestershire that it was very doubtful whether very radical changes would bring about what was desired. Knowledge was now so diffused, and many rural surveyors were so competent that much work now done by them should continue to be done by them, though in every case it might be brought under county administration. But he did say that no hard-and-fast rule should be laid down, because counties varied so enormously. He was satisfied they were not ready to take up any cast-iron system.

Mr. C. F. Gettings (Worcestershire) dealing with the question of classification as regarded the second class roads—of which no doubt there were many in some of the more important rural districts—said there was the question of supervision and management. Undoubtedly there were a large number of cases where they could be supervised under the present system quite as well as Mr. Sinnott had said; but in other cases he did not think it would be advantageous. What he thought would be of assistance to many rural surveyors if those second class roads came more or less under the county council by way of a subsidised road, was that the rural surveyor would be able to carry out work on those roads that he would not get done through his own council. As regarded the remarks which had been made by previous speakers as to friction between county surveyors and rural surveyors, the majority of them would admit that ought not to be. There should be no reason for it. Speaking as a county surveyor, in his own county they had something like eighteen rural districts, and without exception he had the pleasure of knowing the whole of the rural surveyors, and he could get on with all of them without any trouble. The same applied to the urban districts. They did differ, but they differed in a friendly way, and he could not help but think those little differences might be overcome if there was a little elasticity on both sides. He felt rather strongly on the supervision of the second-class roads, because he knew from the recent conferences which he had had in his own county that some of the rural surveyors were very much afraid that they would not get things through which they ought to get through. If they were carried out with assistance given by the county, the county council would deal fairly with them.

Mr. J. F. Hawkins, replying, said there was one point which he wanted to impress upon the meeting, and that was that the paper was not written in any way to bring in any friction between county surveyors and rural surveyors, and he hoped it would not be referred to in any way at all. He did not at present know any county surveyor who was at loggerheads with his district surveyors. Certainly, in his own district they were the best of friends. Whenever there was a meeting to be called there was not a vacant place; everybody turned up, and they worked in the most unanimous way. What he did feel was this. He was talking of the rural districts—not such districts as Mr. Harris represented—in which were rural surveyors who were well qualified men, and who had spent a large sum of money on their education, and who were receiving not 5 per cent on that money, in many cases it was minus per cent. It was for those men he was endeavouring to get a better position, a better tenure, and there was no doubt a county would give this better than a rural district would. Mr. Hooley had practically answered Mr. Weeber, because when he said he objected to three divisions in the county, he would ask how many divisions of a county there were. He should say forty in many counties. Mr. Clarson, of Tamworth, did not say what he asked from the two county surveyors. He might have been grasping in one case and not in the other, and that brought him to loggerheads; but he was so genial a man that he ought not to have any trouble in future.

The next paper to be submitted was the following:

THE ECONOMIES OF MODERN METHODS OF ROAD CONSTRUCTION.

By Francis Wood, M.Inst.C.E.,
Borough Engineer, Fulham.

In considering the economy and efficiency of different methods of road structures for traffic of any character, we cannot do so effectively without giving attention to the supply of materials, the demand and the tendency of values. For example, the price of the granite that has been commonly used in the London area has increased by about 30 per cent. Timber for wood paving has also increased by about 20 per cent. within the past few years, and the quality has been reduced, which is an indication that the supply is not as available as in former years.

INCREASE IN COST DUE TO ECONOMIC CONDITIONS.

The tendency of prices generally is upward, principally on account of a general rise in wages, and wherever prices have not increased they will in due course do so unless some equalising factors are brought in to counteract this tendency. Therefore,

Mr. Francis Wood.

it may be taken that the cost of road maintenance will increase from what may be termed a natural cause, and be quite apart from any consideration of traffic.

But there are economies to be effected by new methods of construction, and in order to discover how these economies are to be effected we must consider the waste or loss in existing methods.

The writer has, on another occasion, raised the question of the relationship of wear due to tractional resistance and wear due to internal attrition, and it is without apology that the matter is again put forward on account of its importance. Some idea is gained of the internal attrition by the tests made a few years back, which are well known to road engineers. By the mere falling of one stone upon another there was abrasion to a very appreciable extent; when moisture was added the abrasion was increased 50 and 100 per cent.

ABRASION OF MATERIALS.

These tabulated results are obviously comparative; the actual abrasion in the road cannot be obtained experimentally, but such abrasion is and must be much more severe when the stones are in contact with each other, and at the same time are undergoing the heavy pressure of traffic, and especially so when it is considered that throughout the year there is 10 to 15 per cent. of moisture in the structure, and during the winter months a much higher proportion. In order to secure some idea of the wear due to internal attrition, a record was taken of the amount of refuse collected from the streets of Fulham. Special records were made of the quantity of manure collected from the wood paved roads (no internal attrition) in 1909 and 1911. The actual surface wear of the wood paving was calculated at 350 tons per annum, and the wear on the remaining roads was estimated, being based on the wear of wood paving under proportionate traffic. The remaining quantity would be internal attrition and moisture, the latter is worked out at 15 per cent. . .

The total decrease of refuse is over 50 per cent. in the eight years, but the internal attrition has reduced by 74 per cent. . .

In 1910-11 the maximum effect of internal attrition was reached, and for the two years that followed it was increasing again. The internal attrition was

[illegible] the road is 1.667 and following [illegible] this [illegible] road is a [illegible] [illegible] that [illegible] [illegible] [illegible]

[illegible] The roads where it has been laid [illegible] have been found to be [illegible] the traffic, although [illegible] any sign of wear.

About five years ago in another case ordinary [illegible] asphalt was laid on a road with light traffic. [illegible] was only a [illegible] in thickness [illegible] it has not yet showed the

SPECIALLY PREPARED TAR.

A tar which has been specially treated to imitate [illegible] has been tested for a few months. The results, although not entirely satisfactory, are such as to lead one to suppose that it may be possible to treat tar so that it may become a competitor with bitumen in the surfacing of roads. [illegible] which being treated [illegible] the [illegible] that the men engaged on the work [illegible] the material was used.

LOCAL TARRED MATERIAL IN BASE.

As the tar [illegible] the tarred material [illegible] a bituminous surface [illegible] hidden away from the [illegible], and as well as well in the future [illegible] to be fitted with rubber tyres, and the bituminous surface acts as a perfect distributor of the weight. It follows that the base can be made with any locally obtained hard stone, whether it be granite, limestone, sandstone, &c. There can be little doubt that with a carefully graded aggregate made almost exactly as one would make concrete, grading from 1½ in. stone down to fine material passing a 200-mesh, it will, with properly prepared tar, make a strong and resilient foundation, and there is no necessity, so far as one can judge, for the thickness to be greater than 2½ in. to 3 in. on a reasonable substructure.

LOCAL MATERIAL FOR SURFACE MIXTURE.

Similarly, with the bituminous surface coat, it can be made with limestone, sandstone, granite, sand, &c., all of which may be obtained locally, and therefore should be cheap. In the case of limestone, sandstone, and granite, the stone should be crushed to a powder, and the [illegible] resulting from such crushing will probably be found to be just the composition for the aggregate, but it may be necessary to use an additional quantity of fine powder. The amount of bitumen required to be used in the mixture depends entirely on the sizes of the particles used. It may be assumed to be roughly about 16 per cent. by weight of commercial bitumen, and as bitumen can be obtained in any part of this country at about £6 to £6 10s. per ton, it follows that when the composition is thoroughly understood the cost will not be greater than that given below

16 per cent. bitumen £6 10s. equals ..	£1	1	8
84 per cent. material 15s. equals	0	12	10
Heating ...	0	1	0
Labour	0	2	0
Machinery and power	0	2	6
	£2	0	0

These figures are about the average price that would prevail, and would be found to apply even to the remoter areas where there might be difficulties.

PERCENTAGES OF VOLUME.

It is customary to specify a composition by percentages of weight, and it must be said that there are good reasons for so doing, but it is unsatisfactory for anyone to use a formula without knowing what are the specific gravities of the various materials used in the composition, otherwise there would probably be different results from those anticipated. In two specific cases the percentages were given by weight. There was a difference of over 2 per cent in the weight of the bitumen, and this difference might have led one to suppose that if the circumstances were identical the result might be failure in one case and success in the other. But it was found, when the specific gravities were allowed for, that the compositions were, practically speaking, identical. Therefore, a formula should give the percentages of volume. The grading of the material must also be known, as the amount of bitumen that is allocated to a composition is a measure of the area of the surfaces of the particles. It is necessary therefore that properly standardised sieves should be brought into use.

To make a formula for universal service would be inadvisable and undesirable. Its consideration alone is a problem which would occupy a paper in itself, and as it is a subject which is being carefully investigated, the details must be left over for a future occasion. There is, however, sufficient information to show that no general specification can be made, but that the specific gravity, quality, and grading of the material must be known, and the bitumen contents allocated accordingly.

SLIPPERINESS OF BITUMINOUS SURFACES.

Where dry rock asphalt is said to be slippery it will be found that this is due to the fact that it contains a large proportion of very small sized particles—such as may be found in ground limestone or a rock asphalt—or where an excess of a hard bitumen is used. This can in a considerable degree be reduced by using an increased size of particles—e.g., sand, crushed granite, &c., and keeping the necessary fine material to the lowest percentage that is necessary to obtain an effective composition, or by using a softer bitumen. If asphalt is slippery in wet weather, so is any smooth pavement, but bituminous surfaces generally retain the least moisture, dry more rapidly, and therefore have advantages from this point of view.

The squeegee coat of bitumen on the tarred or other form of base has its disadvantage in being more slippery, and the synthetic mixture described is more satisfactory, because it presents the individual particles of sand and grit on the surface for wear.

TARRED MATERIALS IN SURFACE.

The tarred material as commonly used will satisfactorily withstand a certain density of traffic; they, however, frequently require a coating of tar to revivify the structure, but once this coating is broken through, the whole structure rapidly disintegrates, especially under concentrated and continuous heavy traffic; it does not seem satisfactory in roads that are damp, and also at the same time under considerable traffic. Being softer in the autumn and wintry weather than bitumen it gives a less resilient structure, and is therefore unable to withstand the shocks of heavy traffic so successfully as the bituminous composition. Similarly in hot weather there is a tendency for the composition to soften in its first year or two, and so become a more severe tax on the traffic.

All compositions that are bound together with hard setting cements, once they have set, become non-resilient, and unless the cementing agent is extraordinarily strong, the shocks given by the traffic, especially where the vehicles are not fitted with rubber tyres, will eventually cause disintegration. In neither case can the material be said to wear evenly and regularly.

The advantage of these materials is that they are primarily cheap to instal; but it is purposely indicated that the bituminous pavement which is in many respects ideal is equally cheap, provided that the composition of the structure is understood. It is, of course, inadvisable to lay such a composition on grades steeper than 1 in 40 where horse traffic prevails, but this applies to all smooth pavements.

BITUMINOUS ROADS AS CHEAP AS MACADAM ROADS.

Private streets are being made up with bituminous pavements at less or the same cost as the ordinary macadam roads, which indicates that the first cost is no more than the previous macadam road.

The costs of the methods above mentioned are based on the supposition that the work is carried out by the local authority. Municipal and county engineers have in the past been responsible for the construction and maintenance of roads, and have been very uniformly successful; there can be no doubt that the future construction and maintenance of roads will be similarly in their hands. No engineer or local authority wishes to lay a form of construction in a wholesale manner without knowing the details of construction in order to be sure that it is being made after a proper model. Such knowledge enables the engineer to repeat the process, and to repair it at some future time. Having all the details, there is nothing of an extraordinary nature which could not be learned by the municipal engineer, and it is in this manner that the principal economies are to be secured.

LIFE OF BITUMINOUS SURFACE.

To show the life of the pavement that has been described, two roads may be mentioned which have been laid 16 years, and which had originally 1½ in. of surface mixture; there is still about ¾ in. left. These roads were laid originally to resist the wear

[illegible] years the [illegible] horses and iron-tyred wheels [illegible] the capacity to [illegible] the [illegible] traffic [illegible] a long period. It is [illegible] rubber tyres, and there is practically only tractional resistance to cause wear, the tyres will suffer more than the road.

[illegible] TO VARIOUS BITUMINOUS COMPOSITIONS

It is [illegible] a suitable [illegible] to use [illegible] in dilution. Carbon bisulphide is a [illegible] of [illegible]. Other [illegible] of bituminous surfacing mixture from a road, and weigh out ten grammes; then find how much carbon bisulphide is required to reduce the composition to its constituent parts. In one case the writer found that the particles fell apart as the carbon bisulphide was poured on to it, whereas in a good surface mixture it takes 24 hours at least to dissolve out the bitumen. This test is by no means an absolute one for determining [illegible] the [illegible] is a [illegible] from a road point of view, but it is one that appeals forcibly to the writer, and indicates that the bitumen in the one case has thoroughly attached itself to the particles, whereas in the other there is merely a surface adhesion, which is easily removed.

It is hoped that the merits of natural bitumen as an agent in the construction of a road surfacing material have not been too strongly emphasised, and by that means tar deprecated for the same purpose. It would be extremely unfortunate if tar was placed in the background.

WOOD PAVING.

It is [illegible] to say that there are many places where wood paving would be laid in preference to bituminous paving, if its first cost were not so high. It has qualities, some of which may be said to be superior to the bituminous pavement, and where first cost is not a material disadvantage it will continue to be laid in large towns where the traffic is of a sufficient and suitable character.

GRANITE SETT PAVING.

Similarly there are areas where granite sett paving is probably of greater advantage than either wood paving or the bituminous pavement.

TARRED PAVEMENTS.

So with tarred pavements; they have their sphere, and it is advisable that they should continue to be constructed where the traffic suits the pavement. Tar is in London equivalent to £2 10s. to £3 per ton, and, having regard to the thickness of the pavement and the amount of material handled, it must be evident that there is from the writer's point of view an economy in the use of bitumen, even at double the price. In other places tar is not in so great a demand and [illegible] is much cheaper and as the traffic is not so intense, it may be the case that the effect of both these factors will be to bring the cost of reconstruction to a lower rate than the writer has set forth for a bituminous pavement. Apart from this, an overwhelming demand for bitumen might cause the price to increase out of proportion to its value. Similarly if tar was found to be by adjustment, of equal value to bitumen, and the demand was severe, the price would also increase, because the daily supply of tar is not sufficient to even tar-spray the whole of the macadam roads in England and Wales during the few months of the year that this method of treating roads is carried out. It is therefore advisable that the tar and the bitumen should be used in their proper spheres, and in this manner the price will be kept at a normal and relatively steady figure.

ROAD MAINTENANCE COSTS WILL DECREASE.

It has been stated that road maintenance and road construction is likely to increase in the future. It is likely very materially to decrease under proper administration. The first cost of reconstruction is apparently increasing the costs; but if this cost of reconstruction is spread over the life of such reconstruction, instead of being added to the cost of the year's work, as is usually the case, then the maintenance costs would show the decrease that is actually occurring.

DISCUSSION OF MR. WOOD'S PAPER

Mr. W. Hart [illegible] a vote of thanks to the author of the paper. He would like to ask one or two questions arising out of the paper. In the first instance, Mr. Wood referred to his bituminous surface. He would like to know exactly what Mr. Wood meant by that bituminous mixture—whether he referred to Trinidad Lake asphalt, or whether he referred to any [illegible] to be [illegible] asphalt, or whether it was a proprietary article of any description. Mr. Wood said a method which has proved very satisfactory was to carefully grade the material [illegible] to a size that would just allow a certain other weight to pass with a weight of about [illegible] per inch of [illegible] worth to compactate it without pushing the material out of position. He would like to know whether he used anything bigger than the ¼-in. grade [illegible] in the next [illegible] that was to say, whether it was all this fine material or composed of any large particles of macadam than ¼-in. and if so, what thickness did he put that material, and whether he had any preparing material underlying it. Then Mr. Wood referred to a specially prepared tar he used. He would like to know what it consisted of, and how it was prepared, or whether it was one of the proprietary articles which were on the market at the present time. If one of the proprietary articles, he should be glad if Mr. Wood would tell them which. Then, under the heading "Life of Bituminous Surface," Mr. Wood said: "Two roads may be mentioned which have been laid sixteen years, and which had originally 1½ in. of surface mixture. There is still about ¾ in. left." Mr. Wood does not mention the names of those roads, and he should be very glad if Mr. Wood did so, as he wanted to go and see them for himself and form his own opinion upon them. He gathered further on in the paper that the bitumen which Mr. Wood referred to was Trinidad Lake bitumen. He asked him for a definite statement on that point. Mr. Wood also referred to wood paving as being even more economical than bituminous road surfaces. He did not suppose Mr. Wood could guide him where the line of demarcation came in. One must use their own judgment as to whether they should go in for wood paving or this bituminous surface, and which was likely to prove most economical in the long run.

Mr. W. J. Hadfield (Sheffield) said he should like to endorse what Mr. Wood said as to the reduced cost of the upkeep of the roads. He knew it was rather an exceptional position, and he was very glad to find that Mr. Wood had laid stress on that point in his paper. He had charge of 314 miles of roads in the city of Sheffield, and during the last sixteen years the cost of maintenance had gone down £23 per [illegible]. The day was coming when surveyors who had been able to reduce their cost of maintenance ought to say so. Those of them who had looked out for the motor traffic and provided for it ought to emphasise that side of the question a good deal more than they did. He spoke early in the discussion so that if any of the speakers had had experience of motor 'bus traffic outside of London they might state what effect it had on their roads. For the last eighteen months they had had motor 'buses running in Sheffield. There had been 30,000 motor 'bus journeys run during the year, and he had not found the tar-macadam damaged by the 'bus traffic. He gave evidence before the House of Commons a fortnight ago to the same effect, and from the correspondence which he had had since, the statement had caused a good deal of surprise.

The Chairman: What tar-macadam is it?

Mr. Hadfield: It is slag tar-macadam laid on the old macadam surface. It is laid in three layers—the bottom 2½ in., the middle 1½ in., and the top ½ in., well sprinkled with chippings for the benefit of the horse traffic. The thickness will be 3½ to 4 in. consolidated.

The Chairman: What is the thickness of the whole bed?

Mr. Hadfield: 3½in. to 4 in. of tar-macadam, with the old road bed underneath. That would be 3 in. to 4 in., and in some cases 6 in. to 8 in.

The Chairman: Is it mixed by the corporation in their own yard?

Mr. Hadfield: Yes; it is local slag which we get in the neighbourhood.

A Member: What is the width of the road?

Mr. Hadfield: The average width of the carriageway would be 18 ft. to 20 ft. of slag. The slag would cost 4s. to 4s. 6d., and the tar 3½d. to 3¾d.

Mr. T. CAINE (Wakefield): What is your experience of motor traffic on a water-bound road?

Mr. HADFIELD: Unless you fairly pay it is hopeless. What I find with a water-bound road, and not unexpected, is that it is affected very quickly indeed.

The CHAIRMAN: How long has this tar-macadam road been under the motor 'bus traffic?

Mr. HADFIELD: Six or eight months.

The CHAIRMAN: It is quite contrary to the experience of a great many of us.

A MEMBER: Did you not desire it in your paper at Yarmouth?

Mr. HADFIELD: No, because it was only recently laid at that time.

Alderman BAINBRIDGE (Stockton-on-Tees) said they had some bad roads, some good roads, and some very good roads. In the paper Mr. Wood spoke about durapavs. They had about 4 miles of tar-macadam which they were experimenting with. He believed there was no finality in this matter of roads at present. He noticed that the roads running from east to west were worst, and were difficult to keep up on the surface. His impression of the cause of this—and he was only a layman—was that from October throughout the winter the roads running from east to west never get a particle of sun, and frost and dampness ruined the surface of the road. Could they suggest any material which would be worse than tar-macadam for a street of that description? Could they recommend anything that would be suitable and was not abnormally costly? The next thing was they had trouble with their motormen. They said that stone of 2 in. to 2½ in. on the surface was far better than chippings. They found that their roads running from east to west wore very badly in two years, and those running north to south would stand 3½ years without touching. That went to show that roads running north to south would stand twice as long as those running from east to west. It was astonishing to find that the district surveyors, and many borough surveyors, should be paid upon such a low scale, and further that they should not have their expenses paid to these meetings. He would not say that they should form a union, because they were a body of professional men, but he would say that union was strength, and if those who were in good positions would use their influence, and the others would learn not to dominate their committees, but to become associated with the most cantankerous ones, and those who cared little about the work, if they would get into contact with them, and get them to understand their position, particularly the working-class members, who had got a little power now, he was bound to say their salaries would not stand at their present unlivable position for another month.

Mr. H. PERCY BOULNOIS (Westminster) regarded this paper as a scientific addition to a number of papers they had had on modern road construction. He thought the diagrams alone were exceedingly valuable. They gave them statistics in a nutshell. It was this class of paper which he thought the institution required to have laid before them. There were one or two points he would like to ask Mr. Wood with regard to the competing pavement which he was advocating. He was not quite clear whether the cost was always about 8s. per super. yard, or whether that was the average, or whether it ranged between certain prices. His point with regard to this artificial asphalt carpeting was this—he wanted to know whether it was any better or any cheaper than the real rock asphalt in a mastic condition, highly gritted. In the year 1873 he was in Buda Pesth, and they were laying gritted asphalt on 3 in. or 4 in. of concrete. That roadway lasted twenty years, at a cost of something like 7s. per square yard. He believed that class of material gritted up to 30 per cent could be laid on 4 in. of concrete for something like 6s. per square yard. If so, he could not help thinking that rock asphalt, the real true asphalt, would make a better carpeting material than these artificial mixtures. If they could make an artificial mixture which would last as long and be cheaper, all well and good, but, personally, he believed in the natural article. With regard to wood paving, the question had already been asked when the limit came when they would use wood in preference to a bituminous surface. It was a little difficult to answer, but he did think there were many cases in towns where wood paving must be cheaper, and certainly was better in many ways to lay than these bituminous mixtures. There was room for both. There was also room for sett paving. The manner of laying granite setts now was very different to what it used to be. They were now properly dressed and laid choc-a-block; there was no rumbling noise over them. They had only to look at Oxford-street—at the bottom of Tottenham Court-road—where they could see a remarkably fine example of granite paving. Each case must be dealt with on its own merits. There was room for wood, for setts, for asphalt, for artificial asphalt, for tar-macadam; but there was no room left for the water-bound macadam road.

Mr. J. S. BROBLE (Blackpool) joined in the vote of thanks to the author, Mr. Wood, and corroborated his experience as to the reduced cost of upkeep of roads. Roughly speaking, in Blackpool during the last fifteen years the roads had been very nearly doubled in length, and certainly the traffic had largely increased. He had not the statistics with him of the cost of his roads, but he thought he might say without contradiction that while the area of the roads and the traffic had very largely increased, as a matter of fact the cost of the upkeep of his roads was very little increased on what it was fifteen years ago. That showed the lasting power of the roads to be better than they were before. He attributed that to one or two special reasons. First of all, it had been the policy of most of them during that fourteen or fifteen years to put in much better foundations to their roads. That was the chief source of the economical use of the roads. If they started with a bad foundation, they might put the best crust they liked on the road, but that road would sooner or later be a failure. Then the second cause of economy was that most of them were putting down every road which had heavy traffic to carry with an impervious crust of some kind; it might be tar-macadam or bituminous material, or wood, hard or soft, or granite setts laid close-jointed, but the nett upshot of it was that the roads now were practically impervious. That seemed to be the great reason why the roads had larger wearing powers than before. The reasons he had given—because he was perfectly sure they had more traffic on their roads than ever they had—seemed to be the only reason why, with the increase of population and the use of the roads, they found the cost of the road maintenance was not seriously increasing. It had always seemed to him an explanation of the complaint they heard at every meeting of surveyors as to why the rural districts found their road expenses going up. In nine cases out of ten the roads in rural districts had very poor foundations, or no foundation at all; consequently when the increased traffic came over those roads they wore away very rapidly, and the cost of maintenance went up by leaps and bounds. He thought the explanations he had offered to them were the real cause—better foundations, impervious crusts. These seemed to him the two leading things, which enabled them, notwithstanding the greatly increased traffic, to keep their road bills down a great deal more than otherwise they would have done.

Mr. W. H. GRIEVES (Sutton, Surrey) believed Mr. Wood was on the right lines in the methods he had adopted, and was proposing to adopt still further. He did this with the more confidence, because he had had during the last two or three years some experience of a like nature in his own district. Over eighteen months ago they laid down on the London and Brighton road a bituminous mixture laid with a carpeting ¾ in. thick of bitumen. That up to the present time, although it had had heavy traffic upon it, did not appear to be disturbed in the very least. He did not quite know whether Mr. Wood's suggestion was to mix with the bitumen a local material. For two years they laid on the same road—a road in the middle of the High-street of Sutton—a carpeting on the top of an existing water-bound macadam road; that carpeting was laid with a proprietary article known as Mexphalte. He did not think there was much difference in that material, which came ready mixed, and the material which Mr. Wood proposed to lay. The very heavy traffic which they had in Sutton did not appear to have disturbed that road in the least bit. On the other hand, the vibration which was so badly felt in the adjoining shop property under the old conditions had entirely disappeared. So satisfied was he of that method of construction of laying a carpeting on the top of an ordinary macadam road that his own council had accepted the suggestion he made to them to purchase machinery for the purpose of making material such as Mr. Wood suggested in the paper. He was proposing to put 1½ in. thick of bitumen.

[illegible] and a mile or so carpet on the roads. He could not make the cost of that material [illegible] on the top of a road of more than 2s. 6d. per square yard. The road, which was a surprising [illegible] that it would not be done to-day [illegible] per yard. He had 2,000 sq. yds. of road he wanted to do with that material, and in the difference of cost of putting that material down on the road experience was the cost he would have to pay to a contractor he estimated he would save a sum of £500. It is that the more heavy [illegible] and heated up to 400 deg. Fahr., and laid it on the road practically at that temperature. Since the last meeting of his council he had placed an order for a machine which would turn out from 40 to 60 tons of sand per day heated up to from 400 deg. to 500 deg. Fahr. That machine was being [illegible] have delivered in the next three weeks, and then they hoped to proceed with their carpeting work, extending it on very much larger lines than before. As Mr. Hadfield had mentioned the tar-macadam [illegible] and that had stood the traffic very well indeed. That cost 3s. per square yard. He thought there was a future in the method of carpeting existing roads. He thought they would not only save a very large amount of money in expenditure on making roads, but they would also save a large amount in the maintenance and upkeep of these roads.

Mr. F. W. Jones (Frome) asked what kind of foundation Mr. Grieves had underneath the road on which he was laying a carpet.

Mr. Bacon: What does it cost to prepare a road before laying the carpeting down?

Mr. Grieves: About 9d. a yard.

A Member: Another item I should like to know in all these cases is the cost of labour. Where you pay 8d. instead of 6d. an hour for labour it makes a big difference in the cost.

Mr. T. W. A. Hayward (Battersea) said the figures of Mr. Wood in regard to scavenging were most convincing. The reduction which Mr. Wood had given in the cost of scavenging with impervious materials practically tallied with his. His scavenging cost to-day was less than one-half what it was ten years ago, and the amount they saved in scavenging was being applied to the better surfacing of the roadways. He used to be, and was still, a great believer in tar-macadam. It was a material which had served its purpose well; but the difficulty was that to-day everybody thought the same, and so there was difficulty in obtaining a good tarred material, and they had to turn their attention to other materials. He had been turning his attention to the methods adopted by Mr. Wood. They were very grateful to Mr. Wood for giving them this paper, bearing in mind the fact that Mr. Wood had only recently joined the institution.

Mr. E. Worrall (Stretford) said the particulars of their extended experiments in Stretford with rock asphalt had been published fully in the volume of their "Proceedings." They had experimented on a very extensive scale, and had this year completed £100,000 worth of work of that character. The difficulty of his council was common to that of all others when facing the problem of the growing traffic on the roads. He was instructed to construct a number of roads in tar-paving, and found it was not a success in the Manchester district. His council were good enough to instruct him to visit most of Germany and France to see what was being done there, and to visit the Limmer asphalt works. As a result of his visit he was in a position to advise his council to put down an experimental street, and that street was in the main in as good a condition to-day as when left by the contractor ten years ago. The cost then was somewhat excessive, because it was practically a monopoly; but since then local contractors had been trained and equipped themselves with plant, with the result that they were able to lay this type of pavement with 1½ in. of asphalt on 6 in of concrete at 8s. per yard, and paths of 1 in. and 3 in. at 4s. to 4s. 6d. per yard. They got [illegible] of pavement a loan for a period of fifteen years, and for private street works they allowed seven years. At the end of fifteen years the cost would be 6d. per yard, which should be a factor in deciding between the present roads or the provision of better roads. The rock asphalt was composed of natural limestone rock asphalt as quarried, which contained 10 per cent of natural bitumen. This was melted down and bitumen added to bring it up to 15 per cent of bitumen. This asphalt was used in the works to the proportion of 80 per cent to which 40 per cent of dry, screened Dalbeattie ⅜-in. granite chippings was added, the remaining 3½ per cent being natural bitumen and other foreign matter. This was floated on the concrete, and then sprinkled with Dalbeattie granite dust, after which it was allowed to set before the road was used. His council was so satisfied with this that they now laid no other pavement. They had also experienced that the public appetite grows with what it feeds on, and the council having [illegible] the distance paved with the material, the public were now clamouring for their streets to be paved, and they found that the cost of doing the work by loan was rather less than other forms of pavement. The property owners who at first strenuously opposed its adoption—there were three appeals to the Local Government Board, and they succeeded were now satisfied, as they found they could let their houses better than in the noisy sett-paved streets. That was, briefly, the experience of Stretford with streets paved with asphalt.

Mr. E. J. Stead (Somerset) asked Mr. Wood what kind of tar he used in all weathers, whether it was ordinary or refined tar. One of the difficulties they had in laying tar-macadam was the very short period of suitable weather they got for laying it. He would also like to ask whether it was satisfactory to put on a tar-macadam gang, with a good mixer, and accumulate a good supply of material so that they could lay it rapidly. They were considering the setting up of a macadam plant to use with limestone from the Mendip Hills.

Mr. Tebbutt (Southampton) said they were laying roads made of an aggregate of a mixture of granite with a proprietary article which they used to the extent of 5 gallons per ton of granite. The proprietary article he understood was one in which tar and bitumen were mixed together, and, judging from the several miles of bitumen macadam which they had laid in Southampton, there was a great difficulty when they had to deal with a bitumen which had to be laid down hot. The quality varied so greatly that places had to be renovated before it had been laid down six months. With a modern road, 3 in. thick coated with this proprietary article the cost came to 3s. per yard of surface. Laid on an old foundation this was a very satisfactory article. One gentleman had spoken of bitumen-surface roads at 2s. 6d. per yard, but in Southampton they were quite unable to surface the roads for less than 3s. a yard; and where they had to remake the road it had been 5s. 2d., and they could not do the same thing now for less than 6s. 2d. per yard.

Mr. S. C. Baggott (Macclesfield) asked what was the greatest gradient on which they could lay rock asphalt. They had some steep gradients in Macclesfield, and the difficulty came in fixing the limit of gradient on which it could be placed.

Mr. Worrall replied that information was given in the paper. Stretford being a flat district, they had not had to lay it on a gradient of more than 1 in 40. It would present difficulties on a steep gradient.

Mr. H. F. Gullan (Belfast) asked, with regard to the carpeting, whether it was Mr. Wood's practice to lay it in all weathers, or did he have to wait for a fine day for the existing road surface to be thoroughly dry. Mr. Hadfield's experience largely coincided with his own. The tar-macadam was laid in three layers in Belfast—the bottom layer 2 in., the intermediate layer 1 in., and a fine coating on the top 1 in. in thickness.

The Chairman: What is the nature of the material?

Mr. Gullan: Whinstone. The stone was treated just as hot as it could be held in the hand without scorching. The tar mixture was then applied. It was the practice to keep the tar-macadam in the bins a period of about three weeks. As regarded laying, the tar-macadam was laid all the year round. The only time it was found to be unsatisfactory was when they had had snow. They had had to stop the work when there had been snow, as the snow had been found a bad thing. In times of heavy rain, it was necessary to knock off for half or three-quarters of a day. The time he particularly watched was when the sealing coat was applied.

Mr. A. J. Price (Lytham), speaking with regard to tar-macadam, said during the last two winters he had laid two lengths of tar-macadam, and had hardly ever been stopped by bad weather. If the material had been well mixed beforehand they could lay it in almost any weather, but with the sealing coat they wanted dry weather. It would then seal and

[illegible] For ordinary repairs they [illegible] the road gave way.

The CHAIRMAN: What is the nature of the material?

Mr. PRIDE: [illegible] road [illegible] Pennsylvania [illegible] road.

Mr. F. WOOD: [illegible] the paper. Mr. Hooper wanted to know what the material was that was used as a surfacing [illegible] and other Trinidad Lake asphalts. In his [illegible] of the paper [illegible] the question [illegible] the material for a road. He had studied this question a very great deal, and he [illegible] more definite information as to the quantity of bitumen to use with any particular quality of sand. One speaker raised a question between artificial asphalt and rock asphalt. As a matter of fact there was very little difference. If they dissolved out the bitumen from the ordinary Trinidad Lake asphalt and passed the mineral matter through sieves they would get the same grading as in the ordinary rock asphalt that was artificially made. Any successful artificial asphalt must be made on the same lines as natural asphalt. Therefore it required some experience to know the right quality of bitumen to use in the [illegible] mixture. In making the mixture the size of the particles must be considered, and the amount of bitumen determined by the size of the particles in the mixture. None of these processes were proprietary. There were companies who, of course, wished to think that their process was proprietary, and wished to make it in a certain way, but it could be imitated, and there was no patentable process in existence. In fact, they had all been anticipated as far back as 1869. The question of laying asphalt had been raised as to whether it should be laid on an old road or on a prepared bituminous base. In making the mixtures which were laid on the surface of the road an excess percentage of bitumen was used so as to give the material resiliency which the other material had not, and they had to rely upon the foundation for. Consequently, in laying an inch on an old road, it was more in the nature of a mastic than an artificial asphalt. The roads about which Mr. Harpur had asked were Norman-road and Starford. The specially prepared tar mentioned in the paper was merely refined tar and pitch, but every portion of it was tested before use and brought to a certain degree of viscosity. It had to pass through a penetration machine before being used in the process. Mr. Stead asked if this material could be used in the winter, and how long it was stored. As a matter of fact it was not stored more than half an hour. It was passed through a heater, coated with tar, and put on the road straightway. That was the position they had worked all through last winter, and laid 25 to 30 tons a day. Mr. Boulnois asked whether artificial asphalt was cheaper and better than mastic asphalt gritted. He suggested that the two processes were very much alike, and that artificial asphalt could be made cheaper and last equally well. Mr. Grieves suggested that his carpeting was not very different from that indicated in the paper. The kind of road on which this inch of material was placed was an ordinary macadam road, picked over until the unevenness had been removed and the contour of the road flattened. For the information of Mr. Stead, he might say that advantage was gained by mixing the material and putting direct on the road. They thus got what was known as the first adhesion of the tarred material.

The section then adjourned.

(To be continued.)

Fishguard Water Supply. Mr. Herbert Samuel, President of the Local Government Board, stated in the House of Commons on Tuesday, in reply to a question, that his attention had been drawn to the repeated reports of the local medical officer of health as to the insanitary conditions of the water supply to the towns of Fishguard and Goodwick, and that he was sending a medical inspector and an engineering inspector to investigate the local circumstances.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

In [illegible] boroughs or cities, there is a great lack of skilled, well trained, roadmen throughout the country, as stated by Mr. G. H. Jack, the county surveyor of Herefordshire, in his last annual report. [illegible] in what manner shall they be trained? Is it not often the policy of local authorities to engage men for road repairs, not because of their energy or skill, but [illegible] and when will such authorities learn that this is most the reverse of economy?

* * * *

What is the correct answer to the following question: If motor omnibuses are to be taxed to support our roads, why should not merchant ships be used to support our Navy?

* * * *

Should we not congratulate Mr. Edgar Dudley on his public spirit in having erected at Oxshott workmen's cottages, costing only £150 each, and containing all the accommodation required by the class of tenant for whom he is catering? Is not Mr. Edgar Dudley one of the inspectors of the Local Government Board, and should not that department encourage him in his [illegible] and [illegible] success?

* * * *

How many surveyors have visited the National Physical Laboratory at Teddington, near London, and if there are not a considerable number who will be surprised to hear that they can gain a considerable amount of useful information by spending an hour or so inspecting this interesting and educational establishment?

* * * *

Is it a fact that the clay soil of a sewage farm may be improved and altered by digging house refuse into it, and how long does it take to effect this change? Is it also a fact, as is frequently stated, that the soil of the sewage farm at Wimbledon has been entirely changed by the adoption of this practice?

* * * *

How long will it take our legislators to realise that the Public Health Act of 1875 is nearly forty years old, and that many of its clauses require revision or amendment in addition to those which have already been dealt with? Is it not true also that the building by-laws of this country are founded on the experience of the Great Fire of London, and that the very strict regulations imposed thereby restrict progress?

* * * *

Should not the Southend borough engineer be congratulated on the manner in which he has dealt with the tramway question in one of his newly constructed boulevards, in which he has so arranged the tram line that it forms a pleasing feature of the road instead of the usual unsightly obstruction which the ordinary street tramway produces?

* * * *

How long will it take for engineers and surveyors to realise the anomaly of constituting themselves sole arbitrators in their specifications for works for which they are responsible? How can any man be judged as an impartial arbitrator when he becomes a party himself in nearly all the questions arising out of an arbitration? Would it not be a better check on both the engineer and the contractor if they knew that a third party would be called in to adjudicate if there was any dispute?

* * * *

Why should so many of the older members of the profession monopolise most of the time allotted for discussion at the meetings of the Institution of Municipal and County Engineers? And why are not the younger members encouraged to air their views, and "try the art of public speaking"?

* * * *

Why should district surveyors be afraid of the nationalisation of our highways, or of coming under the supervision of a central authority? Would not such a movement tend to improve the status of the district surveyor? And would not his salary be largely increased under such management, as the funds from which his salary would be paid must of necessity be less circumscribed than under the present system?

CORRESPONDENCE.

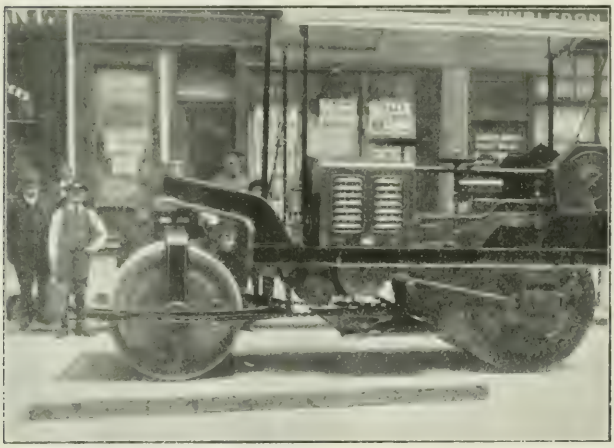
Sir, though I would persuade, I'll not constrain,
Each man's conscience freely is his own
Concerning anything, or anybody.
—MASSINGER. "The Fatal Dowry." Act ii., 2

ASPHALT SURFACING OF ROADS.

To the Editor of THE SURVEYOR.

SIR,—Enclosed herewith a photograph showing an [illegible] which appears to be of importance, and for which I have applied for a patent.

In rolling asphalt applied to carriageways it is necessary to bring the roller to a standstill for the purpose of [illegible] as soon as the front rolls [illegible] on the hottest and certainly on that portion of the asphalt which can least resist their weight; the consequence is that depressions are formed in the asphalt, which should have a perfectly [illegible] surface. [illegible] the [illegible] most carriageways. In order to distribute the weight of the front rolls, and so avoid the formation of depressions, I place a sheet of iron on the asphalt—on this sheet the front rolls rest when the roller is brought to a standstill.



MR. C. H. COOPER'S METHOD OF PREVENTING DEPRESSIONS IN ASPHALT SURFACES.

The photograph shows the roller at rest, with the front rolls on the iron sheet. A straight edge is shown so placed as to demonstrate the reduction in the depression that would have existed had the [illegible] been used. Yours, &c.,

C. H. COOPER,
Engineer and Surveyor.

Town Hall, Wimbledon.
July 3, 1914.

"TWO SPADES AND A BUCKET."

To the Editor of THE SURVEYOR.

SIR,—In reply to "Things One Would Like to Know" in this week's SURVEYOR, it was *not* stated by "the surveyor to one of the smaller local authorities" that a 1d. rate in his district produced £3 10s. My statement was in reply to the attack made on rural councillors by the previous speaker, and I intended to show that when progressive works, such as sewage and town planning, were made a charge on the parish, and not the district, very little could be done, as the rateable value of the parish may be small. I have one parish in which a 1d. rate only produces £2 5s., and as sewage works are a parish charge, you will see that the purchase of two spades and a bucket can very easily affect the rates.

A 1d. rate in my district produces £300. Yours, &c.,

RURAL SURVEYOR.

July 6, 1914.

INDIAN AND EURASIAN STUDENTS IN ENGLAND.

To the Editor of THE SURVEYOR.

SIR,—I was very glad to see in your last issue a reply by "An Anglo-Indian Student Engineer" to one of the questions in "Things One Would Like to Know" as to why there are so many Indian and Eurasian students going up to extract offices in the country?

I should only be too grateful if your correspondents would reply to my questions, which I am fully aware are conditions of a controversial nature and I trust, now the example has been set by "An Anglo-Indian," that others may be moved to take up the points raised.—Yours, &c.,

YOUNG CONSTITUENTS.

July 6, 1914.

DUTIES OF THE SALFORD BOROUGH ENGINEER.

The Salford Town Council on Wednesday discussed at great length a report of the Finance Committee on the duties of the proposed new borough engineer. The report dealt very exhaustively with the powers and duties of the new officer, and opposition was offered by many councillors on the ground that it did not confer full powers on the official. An amendment that where the report affected the Building and Bridges Committee, the borough surveyor should only be called in at the request of the committee was rejected, and eventually the following amendment by the mayor (Alderman Dempsey) was passed by 19 votes against 6:—"That the report be referred back with instructions to amend the same in the direction of strengthening the borough engineer's position, by this being made, as far as practicable, the authority through whom each of the various committees shall exercise the functions appropriate to his position."

In the report of the Finance Committee it is proposed that the new borough engineer should receive a salary of £900 a year, rising by biennial increments of £100 to a maximum of £1,100.

Deal.—We have received a copy of an altogether excellent little guide which has been issued by the Corporation of Deal for the use of intending visitors to that famous town. The booklet, which is copiously illustrated by photographic views, and gives much useful information as to the history, climate, and resources of Deal, is obtainable free on post-card application to the town clerk, Mr. A. C. Brown.

Paraffin to Electricity.—The Criccieth Council held a special meeting on Monday night to discuss the question of a lighting scheme for the town, which is now lighted by paraffin oil. The council passed a resolution in favour of an electric lighting scheme at an estimated cost of £5,500, but deferred a final decision until the ratepayers have been consulted. It was stated that a gas scheme would cost £9,000.

The Proposed New Western Road.—The Select Committee of the House of Lords on Wednesday considered the Middlesex County Council Bill, a measure promoted for the purpose of securing powers to construct a new Western road. There is a clause providing that motor omnibus companies using the new road should pay the county council a sum equal to ⅜d. per car mile towards the maintenance of the road, which will extend for 5 miles, from Heston, by a junction with the Bath road, to Chiswick. The county engineer, Mr. H. T. Wakelam, M.INST.C.E., said it was estimated that 3,588,750 motor omnibuses, with a total tonnage of 21,352,500, and 16,298,162 other vehicles, with a tonnage of 15,491,877, passed over fourteen county roads in a year. Mr. Freeman, K.C., for the London omnibus owners, who object to the proposal to make them contribute to the upkeep of the road, said whereas rich people with motor-cars would use the road free, the vehicles used by poorer people would pay a high rate.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bridelane, Fleetstreet, E.C. [illegible] marked "Assistants' Section" [illegible] Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

[illegible] week answers are invited to the following [illegible]

405. Disinfection. Sketch and describe a form of [illegible] suitable for use in a town of 30,000 [illegible]

406. Building Construction.—Sketch a mansard roof, showing [illegible] also a dormer window in an ordinary roof. (Junior.)

407. Surveying. Describe a method of setting out [illegible] by means of offsets. (M.C.E.)

409. Road Construction.—Give a specification for [illegible] a granite setts paved road suitable for heavy commercial traffic. [illegible]

410. Removal of Sand Bar.—A certain stream [illegible] has become silted up. [illegible] by the formation of a [illegible] 3 yds. What steps [illegible] to prevent a nuisance, and to insure that the stream will be self-cleansing by the action [illegible] (Student.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

404. Collapsing Strength of Pipes.—What is the collapsing pressure in lbs. per square inch of a 3-in. cast-iron pipe, 12 ft. long, and of ¼-in. thickness? Pressure on outside of pipe only. (H. V. A.)

The ultimate compressive resistance of cast-iron, [illegible] used in pipes, lies between 30 and 40 ton/in.², and if a pipe is subject to an external fluid pressure, it will follow a law similar in all respects [illegible] a fluid pressure acts from within, with the difference that the material will be placed under compression in lieu of tension.

If we consider a portion of the pipe 1 in. in length, whose internal diameter is 3 in. and thickness of metal is ¼ in., the area of metal on a cross-section through a diameter will be exactly 0·5 in., and the external diameter will be 3·5 in. Therefore the ultimate resistance of the metal in crushing [illegible]

$$0{\cdot}5 \times 40 = 20 \text{ tons},$$

taking 40 ton/in.² as the crippling stress; or, say, between 15 and 20 tons, taking into consideration the lower value.

Dividing these figures by the external diameter, we get the intensity per square inch of the fluid pressure which would correspond to these values—*i.e.*—

$$15 \div 3{\cdot}5 = 4{\cdot}286 \text{ tons}$$
$$20 \div 3{\cdot}5 = 5{\cdot}712 \quad ,,$$

which is between 9,600 and 12,800 lb./in.².—E. E. W., *Stafford.*

411. Sewer or Drain.—What was the effect of the [illegible] at the case of [illegible] *Urban District Council* v. *Joseph* as regards the meaning of the expression "Single private drain" in sec. 19 of the Public Health Acts Amendment Act, 1890? (R. P.)

The construction of sec. 19 of the Act of 1890 has recently been considered by the House of Lords in the case of [illegible] *Urban District Council* v. *Joseph*, 1914, A.C. 417. In that case a pipe running across the back gardens of several houses took the drainage of those houses into a public sewer. The houses drained into that pipe in pairs, each pair discharging [illegible] by a system of pipes shaped like a Y. Three of these pairs belonged to one owner, and the others to different owners. The stems of the Ys receiving the drainage of two houses belonging to one owner were admitted to be "sewers." The question was as to whether the pipe running across the back gardens was a "single private drain." Two points arose for discussion: First, as to whether the houses were "[illegible] with a public sewer" by the pipe in question, as required by sec. 19, inasmuch as their drainage passed through an admitted public sewer (the stem of the Y) before entering the pipe in question; and, second, as to whether the pipe in question was a "single private drain." On the first point, a majority of the House were of opinion that the intervention of an admitted sewer between the alleged single private drain and the houses served by it does not prevent those houses from being "connected with a public sewer" by such drain within the meaning of sec. 19. In other words, there can be a "single private drain" between two public sewers. With regard to the second point, the judgment of the House is very difficult to understand, and is based on considerations which have not been dealt with in any of the earlier cases. The pipe in question was held to be a "sewer," and not a "single private drain," on the ground that sec. 19 only applies to conduits which (in the words of Lord Atkinson) "secs. 23 and 25 (of the Act of 1875) required the owners to provide or see were provided." Now sec. 23 empowers a local authority to require the owner or occupier of a house which is not sufficiently or effectually drained to make a covered drain emptying into a sewer, or, if there is not a sewer within 100 ft., into a cesspool; and sec. 25 requires a similar drain to be provided in the case of newly-built houses, or houses which are rebuilt. It would therefore appear to follow, as a necessary result of this decision, that the local authority must show that a pipe was a conduit which secs. 23 and 25 of the Act of 1875 required the owners to provide or see was provided, in order to establish that it is a "single private drain," even if it takes the drainage of houses belonging to different owners.

LONDON ARTERIAL ROADS.

SOUTH-WESTERN AUTHORITIES' VIEWS.

The second South-western sectional conference in connection with the proposed new arterial roads in Greater London was held on Monday at the Local Government Board offices. The report of the sub-committee stated that information and the views of local authorities had been collected regarding arterial roads and town planning. The whole of the 26 authorities—out of 28—who had replied dealt with the questions relating to arterial roads; eleven of these regarded the existing roads as inadequate, nine others regarded them as adequate, but named exceptions which practically implied a negative to the question, while six considered them to be adequate. With one exception the authorities did not appear to regard the roads as adequate for expected future traffic. The opinions of the authorities were freely expressed regarding the roads proposed by the Traffic Branch of the Board of Trade. Many authorities considered these proposals generally desirable, and several, including Richmond and Twickenham, regard the proposed Chertsey road as undesirable. Several suggestions were made for widening existing roads and constructing new roads.

On the subject of town planning, twenty-one authorities were concerned with its administration, five had either obtained or applied for authority to prepare schemes, twelve had taken steps or had the matter under consideration, and one regarded it desirable that steps should be taken.

In the twenty-one areas there were 32,861 acres of land likely to be used for building purposes, and about 21,000 houses had been erected in the last ten years. There was a general consensus of opinion that main roads should be wider than required by the by-laws, and that town planning would assist in getting improved roads.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, II., Old Jewry Chambers, E.C., Solicitor of the Supreme Court

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors, so far as municipalities are concerned, provided such be written legibly, on one side of the paper, [illegible] and addressed to "The Law Editor, [illegible] THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not give their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY SUBSIDENCE. BURSTING OF HYDRAULIC MAINS. LIABILITY.—An interesting question was decided in Sampson v. [illegible] and Electric Supply Company v. London Hydraulic Power Co., in the Court of Appeal, April 8th. The plaintiff company, in the years 1882 and 1884, laid cables in certain streets under the powers in the local statutes conferred upon them by the Provisional Order under the Electric Lighting Acts. The defendant company, acting under statutory powers established in two special Acts of 1871 and 1884, laid hydraulic mains in the same streets, etc., partly under the Act of 1871 and the rest under the Act of 1884. The latter Act contained a clause (not included in the earlier Act) that nothing therein should exempt the defendant company from liability for nuisance, and it was provided that the two Acts should be read and construed together as one Act. Water escaped from fractures caused by frosts in all four of the mains, and damaged the plaintiff company's electric cables. The defendant company denied liability, and further contended that, as to the two mains laid down under the earlier Statute, the nuisance was authorised by that Act. The case was tried before Mr. Justice Scrutton, who held (1) that the defendant company, as co-licensees and co-users of the streets, had for their own profit brought into the streets a dangerous thing (viz., water at very high pressure, which, if it escaped, would do enormous damage), and which dangerous thing had escaped through the subsidence of the soil; (2) that the two special Acts must be construed together as one Act, and so that the defendant company had therefore created a nuisance for which they were liable in damages. He gave judgment for the plaintiff company, and this decision the Court of Appeal affirmed. The Court held that the doctrine laid down by the leading case of *Rylands v. Fletcher* (1868, L.R., 3 H.L., 330) applied not only to cases in which the dangerous thing escaped from the defendant's land on to the plaintiff's land, and did damage there, but also to cases (like the present) where the plaintiff occupied land by licence only, and had no right of property in the soil. The appeal was dismissed with costs.

BUILDING LINE. METROPOLIS. LONDON BUILDING ACT, 1894.—An important question as to the effect of the provisions of the London Building Act, 1894, with respect to the general line of buildings in streets was decided in *Clode and Others v. London County Council* (Court of Appeal). The appellants were the owners of houses on the north side of the Euston-road, which road was laid out in 1756 under an Act which provided that no buildings should be erected on new foundations within 50 ft. of the roadway. This Act was repealed by the Metropolis Management Act, 1862, sec. 75 of which provided that no buildings were to be erected beyond the general line of buildings, if the distance of that line did not exceed 50 ft. from the highway, without the consent in writing of the Metropolitan Board of Works. Before 1862 a continuous row of buildings had been erected 50 ft. back from the road. In front of these buildings, and on ground which had formed their forecourts, another row of buildings had been erected 11 ft. back from the road. In 1867 the Metropolitan Board authorised the continuance of these latter buildings, and consented to future buildings being erected up to the 11-ft. line, but no certificate was given by the superintending architect that that line was the general line of buildings. In 1909 a lessee of the appellant Clode proposed to erect a building up to the 11-ft. line, and, this being objected to, he required the council's superintending architect to define the building line. The architect defined it as 50 ft., and his certificate was confirmed by the Tribunal of Appeal, whose decision was affirmed by the Divisional Court. The Court of Appeal held that it was not competent to the council now to declare that the building line which had been authorised in 1867 by the Metropolitan Board was wrong. The appeal was therefore allowed with costs.

QUERIES AND REPLIES.

In order to avoid confusion queristsare requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

WATER SUPPLY. "DEVIL" writes: Notice has been served on the owner of five houses, let at 3s. 9d. per week each, to provide a sufficient supply of water (sec. 62, 1875 Act). There is a local water company who by their Act (of which I have no copy) have power to levy water rates within this area. Assuming the council did the work, in default of the owner refusing to comply with the notice on the ground that the cost would be "unreasonable" (the cost would be about £70 (1) would the council be able to recover the costs incurred? Kindly quote cases, if any. Seeing that the water company have the monopoly (2), could they not be called upon to share, if not to bear, the whole of the cost of laying pipes to within a reasonable distance of the houses? I may add that allowing 5 per cent for the capital cost (£70), and adding the water rate, it would be equal to 6d. per week per house.

(1) The "cost" referred to in this section is the cost of the supply of water, and is quite distinct from the expense of bringing the supply to the premises. If the water cannot be supplied at so low a "cost" as the prescribed maximum, the council cannot require it to be provided under the section. (2) In the absence of any provision in their special Act, the company could not be compelled to contribute to these expenses.

BUILDING LINE. COMPENSATION. "Raydhan" writes: (1) Are the corporation liable to pay compensation in exercising the provisions of sec. 3 of the Public Health (Buildings in Streets) Act, 1888, under sec. 308 of the Public Health Act, 1875? In answering the question I will ask you to assume that the building line is reasonable—say, not exceeding 35 ft. from the fence line, and the depth of the land is reasonably sufficient to allow it. (2) Provision is made in secs. 68, 70 and 71 of the Towns Improvement Act, 1847, to pay compensation in exercising the provisions of those sections. Does the provision apply to sec. 69?

(1) Compensation is payable under sec. 308 of the Public Health Act, 1875, only where a person sustains damage by reason of the exercise of any of the powers of that Act. It is true that the Act of 1888 is to be read as one with the Act of 1875, but it is to be observed that sec. 3 of the Act of 1888 does not confer any powers. It merely prohibits certain things being done without the consent of the urban authority. In my opinion no compensation is payable in respect of any damage sustained by an person by reason of that prohibition. (2) Compensation is payable under secs. 68 and 70, but not under secs. 69 and 71.

TOWN PLANNING. G. H. H. writes: There has arisen the question as to how the site should be measured to obtain the area so as to fix the proportion as to number of houses to the acre: (a) centre of streets and centre of passages regardless of all open spaces that may be in the vicinity, (b) the full street and passages to the plot. The builder claims that (b) is the correct method, because he owns the whole site, out of which the streets and passages are to be made, and that the open space (which is an adjoining recreation ground) should permit this method, as it is favourable to his case.

I am not aware of any rule or decision as to the method of measurement of an area. But I think it would be reasonable, in fixing the number of houses, to have regard (1) to the relative proportions of the ground appropriated for the purpose of streets, passages, and open spaces, and of the ground appropriated for houses; and also (2) to the existence or non-existence of neighbouring open spaces.

PRIVATE DRAIN OR PUBLIC SEWER?—"Malcolme" writes: A street or road within this district has been laid out, kerbed and channelled complete with a 9-in. drain, and proper quantity of gullies to drain the street. This drain empties into the council's sewer. There are no buildings as yet on this street. Is this drain a public sewer, and such as could be claimed to be used by any property built within 100 ft. thereof? The street is a private street.

By sec. 4 of the Public Health Act, 1875, "sewer" includes sewers and drains of every description, except (1) "drains" as defined by the section, and (2) drains vested in or under the

The Surveyor

And Municipal and County Engineer.

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control of any authority having the management of roads and not being a local authority under the Act. It is clear that there may be a sewer without drains connected with it. See *Bradford* v. *Eastbourne Corporation* (1896, 2 Q.B., 205). In my opinion this is a "sewer," and unless it falls within either of the exceptions mentioned in section 13 of the Act it is vested in the council, and the owners or occupiers of premises within the district are entitled to cause their drains to empty into it, subject to the conditions prescribed by section 21.

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTH-WESTERN DISTRICT MEETING AT MANCHESTER.

A two days' meeting was held at Manchester on Friday and Saturday, July 3rd and 4th, the meeting on the first day being of a social nature, and on the second consisting of a visit to works. The first item on the programme on Friday was tea at the Midland Hotel, and the following were among the members who attended this and other functions: Messrs. W. Heath, vice-president, county surveyor of Cumberland, and chairman of the Northern District of the institution; A. R. Bleazard, borough surveyor of Clitheroe, and chairman of the North-Western District of the institution; John T. Pegge, past-president of the institution, and city surveyor of Durham; John T. Shield (Blackburn), Arthur Foster (Salford), A. Dempsey (Crewe), Geo. Hayes (Westhoughton), James Sellers (Little Lever), James T. Davies (Little Hulton), G. H. Hopkinson (Chorley), Wilson Briggs (Stockport), Tom Fogg (Heywood), E. Walker (Stretford), R. J. McKenn, Hon. District Secretary, and B. Wyand, Secretary of the institution. There were also a number of visitors present. The members and their friends sat down to tea at six o'clock, and a meeting of the council was held afterwards.

At the smoking concert which followed the chair was taken by Mr. Finch. The various items were deservedly encored, and the chairman in his few words of thanks to Mr. McKenn and the artistes laid special stress upon the splendid programme that had been provided, by the kindness of Messrs. Fogg and Bleazard.

On the Saturday a visit was paid to the Ashton-under-Lyne, Stalybridge and Dukinfield waterworks, an inspection being made, under the conduct of Mr. Fred. J. Dixon, F.G.S., M.INST.C.E., engineer to the Joint Water Committee, of the very modern filtration plant and other works at Brushes and Ashway Gap. At Ashway the party were kindly entertained to tea by Mr. Dixon.

NORTHERN DISTRICT.

The meeting of Alnwick [illegible] July 11th to July 18th.

COUNCIL MEETING.

At a meeting of the council held on May [illegible] and July 3rd the following applicants were recommended for admission.

To Membership: Messrs. F. Sutcliffe, surveyor, Barrowford Urban District Council; G. Berry, surveyor and sewer, Leek Rural District Council; and H. L. Swindlehurst, shire engineer, Mulwaree Shire, Goulburn, N.S.W.

To Associate Membership: Messrs. Bernard Stace, assistant surveyor, Skirlaugh Rural District Council; Chas. Snell, assistant surveyor, Abersychan Urban District Council; A. L. Robinson, sanitary surveyor, Cuckfield Rural District Council; and F. R. Sheriff, assistant engineer, Public Works Department, India.

Transfer to Associate Membership: Mr. B. L. Chopra, Northcote Mansions, Gloucester.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

New Members.—From the applicants recommended for admission at the last meeting seven members were elected, one associate member was transferred to membership, and four students were transferred to associate membership.

Architects Registration Bill.—It was decided to agree with the suggestion made by the Society of Architects that a conference of representatives of the two bodies (the society and the institution) be held, and further that the name of Mr. A. R. Bleazard should be added to any such committee.

Membership Badges.—It was decided to accept the quotation of Messrs. Fattorini & Co. for the supply of these, and to place an order for 500. These badges will be supplied to corporate members and students at one shilling each, and due notice will be given when they are ready.

The next meeting of the council will be held in London on Wednesday, July 22nd.

An invitation has been extended to the members of the Institution of Municipal Engineers to attend the municipal conference which is to be held at the Anglo-American Exposition, Shepherd's Bush, London, from July 20th to 25th, and of which Viscount Peel, the chairman of the London County Council, is the president. The mayors of the principal cities of the United States and other delegates will arrive in London in time for the opening day. The object of the conference, which has the warm sympathy and support of the Government of the United States, is to bring about an interchange of information between the governing bodies of the great municipalities of Europe and America. It is proposed that after the conference a tour should be made by the American delegates through the most important cities in the various European countries for the purpose of studying in a practical way the methods used there.

New Town Hall for Marylebone.—The Princess Royal on Wednesday laid the foundation stone of the new town hall for Marylebone, which is being erected in the Marylebone-road, at a cost of nearly £100,000.

Surrey East and West Road.—In the House of Commons on Tuesday the Financial Secretary to the Treasury was asked when it was proposed to proceed with the widening of the east and west road through Surrey, and when the construction of the part immediately west of Dorking was likely to be undertaken; was he aware that proprietors of land abutting on the road had been informed that it was desirable to postpone frontage improvements in view of the possibility of a strip of the land being required for widening; and, in order to avoid unnecessary expenditure of private and public funds, could anything be done to accelerate a decision on the subject? In reply, Mr. Montagu stated that no application in respect of the scheme in question had been submitted to the Road Board, who had no knowledge of negotiations with landowners. The board regarded the scheme, however, as one which might well be executed with their assistance in a period of trade depression.

"BITUVIA" ROAD CRUSTS.

[illegible] is employed, and it is safe to prophesy that this [illegible] will [illegible] and [illegible] in the near future.

[illegible] this firm to surveyors and others interested are well [illegible] Messrs. Engert & Rolfe claim that their proposals

High-road near Water Tower, Epping

Messrs. Engert & Rolfe at, among other places, [illegible], Wolverhampton, Woodford, [illegible], East Ham, Belfast, Leicester, Letchworth and Southampton, under severe conditions, furnish the most conclusive proof of the efficacy of this form of road crust.

Without revealing the component parts of "Bituvia" possess the most essential conditions for genuine economy, as the work can be effectively carried out by local labour, and where obtainable, with local hard stone or with slag or screened clinker, though, naturally, for main thoroughfares in town districts granite is strongly recommended.

It is impossible to over-emphasise these advantages,

Knighton High-road, Woodford.

we may say that specially refined and prepared Trinidad Lake bitumen forms the basis and the greater percentage; consequently, on this account it is claimed that this "binder" grout is, to all practical intents and purposes, indestructible, and that it is not influenced detrimentally by climatic conditions. Under low temperature, the material will not harden so as to become brittle, and under high temperature it possesses toughness to an extraordinary degree. There is [illegible] highway is doubly effective in times of trade distress, either general or local; work of this character obviously opens a field for the employment of a considerable amount of casual labour.

Messrs. Engert & Rolfe's No. 1 Specification provides an excellent road crust for those thoroughfares used by motor 'buses and other heavy mechanically driven vehicular traffic, and the surface would require very little, if any, attention for at least from five to

[illegible] country roads.

[illegible] that, as the result of a series of trial roads, they find that 5s. 6d. per yard super. would be a fair average [illegible] for the No. 2 Specification.

Possibly the strongest points in favour of this system are the facts that (a) [illegible] voidless internal attrition is impossible; (b) that these crusts are absolutely waterproof; (c) that, owing to [illegible] able friction and vibration. Finally, these advantages, [illegible] per super. yard.

[illegible] yds. super. for the Woodford main roads and bus [illegible] engineers, and are delighted at all times to give inquirers the best advice at their command, based [illegible] experience.

"Knighton," High-road, Woodford.

Official Fire Tests.—The British Fire Prevention Committee conducted two series of fire tests last week at their Regent's Park testing station. The first of these dealt with a fibrous material suitable for partitioning and panelling, known as "Calno," which was put before the committee by the Fireproof Fibre Building Boards, Ltd. It was tested in panel form of various thicknesses, the thinner panels for duration, and the thicker ones for the committee's standard 45 minutes' test, with a view to obtaining the classification for affording "temporary protection" (Class A). The second series was with a partition and with two doors of non-flammable wood treated by the Timber Fire Proofing Co., Ltd. The partition was submitted to the committee's 45 minute test with a view to obtaining the classification for "temporary protection" (Class A), and the 2-in. doors to the one hour test with a view to obtaining the classification for "temporary protection (Class B). The temperature throughout these tests had to range from 1,500 deg. to a temperature not exceeding 1,650 deg., and [illegible] from the steam fire-engine. The result of the tests will be submitted in the form of a report in due course. The next testing day at the Regent's Park Testing Station will be July 22nd.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Axminster R.D.C. (June 25th. Mr. P. M. Crosthwaite). £1,150 for works of water supply. It was explained that the money was required chiefly for the construction of a new reservoir.

Bognor U.D.C. (June 30th. Mr. M. K. North).—£10,000 for the purchase of the Rock Garden property on the front for the provision of winter gardens. Negotiations, it was explained, were proceeding with the owners of the remaining property, and that when the purchase of this had been effected a comprehensive scheme would be submitted by the council.

Coventry T.C. (June 24th. Mr. Edgar Dudley).—£532 for the purchase of property for the widening of Narrow-lane.—The city engineer, Mr. J. E. Swindlehurst, stated that the present width of Narrow lane at the point it was proposed to widen varied from 17 ft. to 20 ft., and it was intended to make it 40 ft.

Manchester T.C. (July 7th. Mr. H. R. Hooper). [illegible] for the purposes of the electrical undertaking.—In the course of the proceedings the inspector found fault with the corporation for devoting a proportion of the profits of the electricity undertaking towards the relief of the rates, his chief reason being that electrical undertakings need all the money they can get to keep pace with the progress of the industry. Mr. Hooper also objected to the corporation borrowing £5,000 to supply motors for hire to customers, and suggested that they should save the interest by finding the money out of revenue instead of capital. It was stated that in the past twenty years the electricity department had contributed £179,185 towards the relief of the rates.

Sheffield T.C. (July 3rd. Major J. Stewart).—£19,832 for works of sewerage. It was stated that the cost of labour and materials had increased greatly during the last two years. Pipes had gone up 30 per cent, labour 10 per cent, and team work 10 per cent. There was no probability of labour or team work, which represented 60 per cent, coming down in the near future. The evidence showed that in 1901 the city had 110 miles of rubble sewer, but by March last this mileage had been reduced to just over 25 miles.

Sudbury T.C. (June 25th. Mr. W. M. Cross).—£1,400 for the provision of new power and pumping plant at the waterworks.—It was stated that the council expected to effect a nett saving of £46 a year by the proposed new machinery.

Tavistock R.D.C. (July 7th. Mr. H. S. Bidwell).—£900 for works of sewerage and sewage disposal at Lydford.—The medical officer of health, Dr. Brodrick, said the proposal had been under discussion for many

[illegible] It was desirable that the scheme should be carried out, although the village was exceedingly [illegible] and there was no electricity [illegible] for some years.

Whitley and Monkseaton U.D.C. (July 3rd. Mr. A. W. [illegible] Mr. A. J. Bassett, [illegible] of the proposed work [illegible] the [illegible] expenditure.

Wirksworth U.D.C. (June 30th. Mr. R. H. [illegible] tenders for the construction of [illegible] the [illegible] Corporation. The Engineer said that the [illegible] would be [illegible] for the [illegible] with regard to the sewerage scheme. The surveyor, Mr. J. E. Wardle, stated that the present cost of lighting and extinguishing the lamps was [illegible] per annum, and that when the new [illegible] were installed a saving would be effected of £18 [illegible] per annum, or an equivalent of £28 [illegible] in addition to the saving in wages.

APPLICATIONS FOR LOANS.

Biddulph U.D.C. £900 for the purchase of property [illegible] improvements.

Blackburn T.C. £35,200 for road improvement.

Colchester T.C. £4,[illegible] for wood paving, £4,000 for [illegible] and £3,110 for extensions to the isolation hospital.

Coventry T.C.—£810 for road widening.

Darlington T.C. £[illegible] for the electricity undertaking.

Durham C.C. £1,050 for the purchase of a school site at Easington.

Falmouth T.C. £1,350 for paving footpaths with tar-macadam.

Gateshead T.C.—£7,428 for the extension of the secondary school.

Hinckley U.D.C. £1,065 for a new sewage pumping main.

Horwich U.D.C. £11,000 for the improvement of Chorley New road.

Hungerford R.D.C. £1,000 for workmen's dwellings.

Ludlow T.C.—£4,000 for a housing scheme.

Morley T.C. £[illegible] for works of sewerage.

Newcastle-under-Lyme T.C.—£1,000 for electrical machinery.

Oldham T.C. £[illegible] for the electricity undertaking.

St. Helens T.C.—£25,000 for a housing scheme.

West Bromwich T.C.—£4,423 for the purposes of the electricity works.

Wigan T.C.—£150 for a public convenience.

Wolstanton U.D.C.—£1,911 for works of sewerage.

Wrexham T.C. £3,025 for the electricity works.

LOANS SANCTIONED.

Barnoldswick U.D.C.—£4,000 for works of water supply.

Biddulph U.D.C.—£10,301 for the purchase of the local gas undertaking and extensions of the gas-works.

Birkenhead T.C.—£865 for a school clinic.

Brampton R.D.C. £130 for works of water supply.

Chester-le-Street U.D.C.—£42,700 for the provision of workmen's dwellings.

Colne T.C.—£1,250 for electricity mains and for a booster.

Dartford U.D.C.—£1,691 for the extension of the recreation ground, and £300 for footpaths.

Ellesmere Port U.D.C.—£1,627 for the purchase of a site for workmen's houses.

Grantham T.C.—£448 for cemetery extension.

Halesowen R.D.C.—£257 for sewerage and surface-water drainage.

Haywards Heath U.D.C.—£2,300 for the purchase of a site for a cemetery.

Maidenhead T.C.—£470 for sewer extension.

Paddington B.C.—£5,524 for machinery in connection with the electricity undertaking.

Southmolton R.D.C. £800 for works of water supply.

Swansea T.C. £18,[illegible] for a new school.

Westminster B.C.—£2,000 for street improvement.

FORTHCOMING INQUIRIES.

JULY.

			£
13.	**Chester-le-Street.**	For a housing scheme (Mr. H. A. Chapman)	12,200
13.	**Darlington.**	For street improvement and surfacing (Mr. R. H. Bicknell)	19,972
13.	**Harpenden.**	For street improvement (Mr. F. H. Tulloch)	489
13.	**Midhurst.**	For a housing scheme (Mr. H. G. Hetherington)	780
14.	**Ammanford.**	For bridge construction (Mr. P. M. Crosthwaite)	1,500
14.	**Bishop Auckland.**	For a bandstand and bowling green (Mr. R. H. Bicknell) ...	700
14.	**Guiseley.**	For works of sewage disposal (Mr. A. W. Brightmore)	3,700
14.—	**Hayfield.**	For the provision of public conveniences (Mr. M. K. North)	150
14.	**Melksham.**	For the purpose of municipal buildings (Mr. W. O. E. Meade-King)	2,200
14.	**Neath.**	For works of sewerage (Major J. Stewart)	230
14.	**Newton-in-Makerfield.**	For a housing scheme (Mr. H. A. Chapman)	7,100
14.	**Orsett.**	For additions to the isolation hospital (Dr. F. Seymour)	1,114
15.—	**Birkenshaw.**	For works of sewage disposal (Mr. A. W. Brightmore) ...	600
15.	**Bournemouth.**	For works of drainage (Mr. W. O. E. Meade-King)	1,000
15.	**Cleckheaton.**	For works of sewerage (Mr. R. H. Bicknell)	1,357
15.—	**Evesham.**	For a housing scheme (Mr. A. G. Drury)	3,400
15.	**Haslingden.**	For paving, and the purchase of a motor tip wagon (Mr. M. K. North)	1,015
15.	**Llandudno.**	For a housing scheme (Mr. H. A. Chapman)	1,855
15.—	**Llanelly.**	For works of sewage disposal (Mr. P. M. Crosthwaite)	41,253
15.—	**Penarth.**	For the purpose of public urinals (Major J. Stewart)	225
15.—	**Reading.**	For the purposes of condemned meat disposal (Mr. R. G. Hetherington)	985
15.	**Walton-upon-Thames.**	For the purpose of a recreation ground (Mr. Edgar Dudley)	1,450
16.	**Brierley Hill.**	For the provision of a cemetery (Major J. Stewart)	6,600
16.—	**Plymouth.**	For road widening (Mr. W. O. E. Meade-King)	1,900
16.—	**Todmorden.**	For street improvement (Mr. M. K. North)	3,900
16.—	**Worcester.**	For the provision of a public convenience and an air-gauge to the waterworks (Mr. A. G. Drury)... ...	1,070
17.	**Ashton-under-Lyne.**	For works of sewage disposal (Mr. A. W. Brightmore)	14,200
17.—	**Penzance.**	For the provision of public conveniences (Mr. W. O. E. Meade-King)	1,355
17.—	**Southgate.**	For a housing scheme (Mr. H. S. Stewart)	10,465
18.—	**Friern Barnet.**	For street improvement (Mr. R. H. Bicknell)	3,281

TOWN PLANNING.

JULY.

14.—	**Kingston-upon-Hull.**	(Mr. George L. Pepler)	—
21.—	**Grays Thurrock.**	(Mr. Thomas Adams)	—
27.	**Leeds.**	(Mr. Thomas Adams)	—
28.—	**Wallsend.**	(Mr. George L. Pepler) ...	—

Municipal Work in Progress and Projected.

The Editor invites the assistance of Surveyor readers with a view to making this [illegible] complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings Birmingham £30,295, Dudley Sheffield; housing and town planning Newcastle on Tyne £25,000, roads and materials Colchester £15,000, sewerage and sewage disposal Barry Port, Leek £6,700; water, gas and electricity Birmingham £700,000. Particulars of other projected works will be found in our "Local Government Board Inquiries" [illegible]

BUILDINGS.

Batley T.C.—A scheme has been approved for a new police station, police court, and inspector's house, at an estimated cost of £6,300.

Belfast T.C.—The provision of additional washing baths at Templemore Baths has been referred to the city engineer for report.

Birmingham T.C.—The Watch Committee recommend the adoption of the plans of the city engineer, Mr. H. E. Stilgoe, for the extension of the Victoria Courts, at an estimated cost of £30,295.

Cheltenham T.C.—For the conversion of five houses on the Promenade (which have been purchased for £5,500) into municipal offices, the town council on Monday accepted a tender at £5,574.

Criccieth U.D.C.—Plans are to be prepared for two harbours on the sea front.

Derby T.C.—The council have agreed to a recommendation for the construction of a new lavatory and the improvements at the Spot.

Dudley T.C.—The town council have decided to invite competitive designs from qualified architects within 150 miles of the borough for a new town hall, municipal buildings, and police-station. The buildings are to be erected in sections extending over a series of years owing to the site being now occupied in part by smaller buildings. The work will probably be proceeded with in the following order: Police buildings, municipal buildings, and town hall. Designs, however, will be invited for the whole scheme. All the main frontages will be in Priory-street.

Dundee T.C.—A new sub-station for electricity purposes is to be built in Walton-street, at an estimated cost of £6,500.

Norfolk C.C.—The contributions promised from other sources having amounted to the sum of £1,200, the council have undertaken to rebuild Ludham Bridge.

Paddington B.C.—The Baths and Washhouses Committee have recommended that instead of thirty-two Russian baths, provided for the Porchester-road establishment, only sixteen such baths should be provided, and that Turkish baths for twenty persons should be substituted, at an estimated cost of £1,800 over the original estimate.

Sheffield T.C.—The Improvements Committee recommend the expenditure of a supplementary sum of £11,553 in connection with the town hall extension scheme.

Stepney B.C.—It has been agreed to make a contribution of £1,800 towards the London County Council scheme for the widening of Gunmakers' Arms bridge, provided the London County Council carry out the work upon the general lines of the plan prepared by the borough engineer, Mr. M. W. Jameson.

Sunderland T.C.—Investigation has shown that the Wearmouth Bridge, which connects Sunderland and Monkwearmouth, has been damaged through the mining operations. In view of this damage, and of the fact that the bridge is too narrow for the traffic, the Bridge and Ferries Committee recommend that estimates and plans be prepared for a new bridge. The mining company have agreed to pay a substantial sum in respect of damage to the existing bridge.

West Hartlepool T.C.—The Health Committee recommend the town council to build a sanatorium for consumptives. With fifty beds and six shelters, the capital outlay, including furnishing, is estimated at £6,150, of which the Government, it is expected, would grant about three-fifths, leaving £2,475 to be provided locally.

Willesden U.D.C.—The Works and Open Spaces Committee have been asked to report on the advisability of providing an open-air swimming bath in the Sandbridge recreation ground.

HOUSING AND TOWN PLANNING.

Batley T.C.—The Housing Committee have been asked to prepare a housing scheme, with plans and estimates.

Cardiff T.C.—Tenders are to be obtained for the erection of 143 houses in Parkminster-road.

Chester-le-Street R.D.C.—A scheme has been adopted for the erection of 100 workmen's dwellings at Harraton.

Kingswood U.D.C.—A committee has been formed to make inquiries as to a suitable site for and the cost of erecting a number of workmen's dwellings.

Liverpool T.C.—The twenty-second housing scheme of the corporation—the latest instalment of a movement which has already cost nearly £1,200,000—situated in a district between St. Anne-street and Christian-street, was formally inaugurated last week. Insanitary dwellings numbering 124, containing a population of 563, have given way to seventy-eight new dwellings for 406 persons. The buildings were designed by Mr. Turton, surveyor to the Housing Committee.

Ludlow T.C.—The council have approved the plans of a housing scheme prepared by the borough surveyor, Mr. W. G. Lane, and estimated at £4,000.

Newcastle-on-Tyne T.C.—The Housing Committee have approved schemes for building 138 workmen's dwellings, at an estimated cost of £[illegible]. The houses are to be erected in St. Lawrence-square and Walker-road. In Lawrence-square the scheme provides for eighty-four two-roomed dwellings at 4s. 9d. per week, and twenty-eight three-roomed dwellings at 6s. 3d. per week. The total number of dwellings is 112, containing 252 rooms. The amended Walker-road scheme provides for eight two-roomed dwellings at 5s. a week, eight three-roomed dwellings at 5s. 8d. per week, the total number being sixteen, containing forty rooms.

Newport (Mon.) T.C.—In addition to recommending that another housing inspector be appointed, the Housing Committee have instructed the borough architect to submit reports on housing schemes alongside Llisswerry-road and near Downing-street, together with the Somerton estate scheme.

Stamford T.C.—After having been rejected, a proposal for the erection of twenty-four workmen's dwellings, at an estimated cost of £4,000, was passed recently by the council, consequent upon a petition sent to the Local Government Board by 400 citizens.

Westminster B.C.—Negotiations have been opened with a view to the erection of workmen's dwellings in Poland street.

PARKS AND OPEN SPACES.

Leeds T.C.—Municipal golf links are to be laid out at Roundhay Park at an estimated cost of £200.

Rothes T.C.—It has been decided to acquire a lease of the park in Spey-street, adjoining the Great North of Scotland Railway, and extending to 5 acres, with the object of laying it out as a recreation ground for the inhabitants.

REFUSE COLLECTION AND DISPOSAL.

Cork T.C.—The question of a site for the disposal of refuse has been referred to the consideration of the city engineer, the medical superintendent of health, and the law adviser.

Stockton T.C.—Extensions to the refuse destructor have been completed at a cost of £961, £98 below the estimate.

ROADS AND MATERIALS.

Colchester T.C.—The Road Board have sanctioned a scheme for the reconstruction of the scheduled main roads with bituminous macadam, at an estimated cost of £15,000.

Derby T.C. [illegible]

Foleshill R.D.C. [illegible]

Leicester T.C.—An improvement is to be carried out [illegible]

Morley T.C.—The West Riding County Council have [illegible] Bridge-street.

Newcastle (Ireland) U.D.C.—The tender of Mr. [illegible] at £300 has been accepted [illegible]

Norfolk C.C.—The county surveyor, Mr. T. H. B. Heslop, in a report submitted to the council on Saturday last, states that the total cost per mile for ordinary road maintenance, including all items (except improvements, road tarring, flood damage, and Road Board work), such as management, steam rolling, tools, stationery, and also repairs to footpaths, was £51 7s. 2d. With the very great increase in motor traffic, and also in traffic of a heavy character, it was inevitable that there must be a considerable increase in expenditure if the roads are to be kept in a reasonable state of efficiency. The whole of the more important main roads should be coated with granite or some more permanent material, the local materials now used being quite unsuited to present-day traffic. Surface tarring in the principal towns and villages has again been carried out to the evident satisfaction of the public. One hundred miles of road were treated, as against 91¾ miles in 1912. One hundred and seventeen miles of road were being tarred this season. In addition to this the whole of the 17 miles [illegible] constructed under the 1911-12 Road Board grant would again be retarred in 1914, a considerable portion of the cost being paid by the Road Board.

Paddington B.C.—The borough surveyor, Mr. E. B. B. Newton, has been instructed to fix five temporary street refuges, in order to give an opportunity of judging of their utility.—The tender of Messrs. W. W. Howard, Bros., & Co. has been accepted for wood-paving blocks, and the tender of Mr. H. J. Green- [illegible]

Penge U.D.C.—The surveyor, Mr. H. W. Longdin, [illegible]

Perthshire C.C.—The Blairgowrie District Committee have agreed to carry out the road improvement scheme sanctioned by the Road Board at a cost of £3,000, and the road surveyor has been instructed to prepare a further scheme, under which an expenditure of £25,000 will be incurred, the disbursements to be spread over a number of years.—The West Perthshire District Committee have received an intimation that the Road Board have approved of the scheme for the construction of about 25 miles of roads in the Killin district at a cost per mile of about £450. The board will give a grant of £9,000 and lend the District Committee £2,000, free of interest, repayable in four annual instalments.

Stepney B.C.—Acting upon a report by the borough engineer, Mr. M. W. Jameson, the council have approved of an amended plan, proposed by the London County Council, for the widening of Commercial-road to 70 ft., at an estimated cost of £24,000.

Stockton T.C.—The borough engineer, Mr. M. H. Sykes, has received instructions to prepare plans for [illegible]

West Riding C.C.—In accordance with the suggestion of the Road Board the Highways Committee propose to arrange conferences with the highway authorities in the Riding, and also with the county councils of adjoining counties, with a view to co-ordination of the proposals to be submitted to the board on the subject of road classification. The records of traffic will be taken during the months of July, August, and September. The Road Board state that, in view of the object of the proposed classification, highway authorities must bear any costs incurred in connection with the traffic census and the preparation of proposals for classification, and the committee recommend that the county council should bear the expense—estimated at £1,550—of taking records on main roads at points approved by them.

Worthing T.C. [illegible]

SEWERAGE AND SEWAGE DISPOSAL.

Alcester R.D.C.—With respect to the sewage [illegible] have a piece of land rent free for the erection of a filter bed, subject to the plans being approved by his surveyor. The council have decided to ask Mr. Woodhouse's surveyor to prepare plans that would be satisfactory to him, and submit them to the sanitary [illegible]

Brampton R.D.C. The Local Government Board have advised the council that they are prepared to sanction the proposed sewerage scheme for Castlecarrock, at an estimated cost of £1,260, but that if the council are of opinion that an equally satisfactory scheme could be devised at a less cost, the board would be prepared to consider it.

Burry Port U.D.C.—The council have instructed Mr. A. P. I. Cotterell, M.INST.C.E., of Westminster, to prepare a scheme of sewerage and sewage disposal for their district.

Clones U.D.C.—Sanction is being sought for a [illegible] £2,700.

Hebden Bridge U.D.C.—Messrs. J. Newton, Son & [illegible], Manchester, have prepared plans for the [illegible] of the sewage disposal work, [illegible] £22,000.

Ipswich T.C.—Subject to sanction being obtained to a loan, the council have agreed to purchase a motor boat for the removal of sludge.

Leek R.D.C.—A decision has been reached to proceed with the Endon sewage disposal scheme [illegible] estimated cost of £6,700.

WATER, GAS, AND ELECTRICITY.

Birmingham T.C. The Water Committee recommend the council to authorise the construction of a third pipe line from the Elan Valley to Frankley reservoir at an estimated cost of £700,000. The committee recommend that the work be entrusted to Mr. F. W. Macaulay, at present the Elan supply resident engineer. Mr. Macaulay has been associated with the department since 1896, and they feel that the responsible work involved in the extension of the Elan scheme may be safely entrusted to him. They recommend that he be now appointed the Elan supply engineer, thus making him responsible not only for the administration of existing works, but for advising the committee as to future requirements, and designing and carrying out any additional work. On his appointment to this new office the committee recommend that Mr. Macaulay's salary be increased from £1,000 to £1,200 per annum. They also feel that it will be necessary to provide Mr. Macaulay with a fully-qualified assistant, and in view of the temporary character of the appointment they recommend that the salary of the assistant engineer should not be less than £600 per annum. The committee also recommend the construction of a balancing reservoir at Highter's Heath, Yardley Wood. The design for the reservoir has been prepared by the local engineer, Mr. William Gray, and approved by them. The dimensions are 344 ft. by 190 ft., with a water depth of 10 ft., and a total capacity of 4,000,000 gallons. The estimated cost, including the provision of a keeper's cottage and fencing, is £17,142, and the committee recommend the council to authorise them to advertise for tenders for carrying out the work. The main required to connect the new reservoir with the distribution system comprises a length of 2,928 yds. of 30-in. cast-iron pipes, the estimated cost of which is £10,912, and this work will be put in hand concurrently with the construction of the reservoir.

Brampton R.D.C.—The council have instructed Messrs. Taylor & Wallin, of Newcastle-upon-Tyne and London, to prepare a scheme for and report fully upon the water supply of the parish of Cum Whitton. The water will probably be obtained from copious springs on the fells, and several miles of mains are likely to be required. This is the fifth scheme which the Brampton council have intrusted to Messrs. Taylor & Wallin.

Dewsbury T.C.—A report with respect to the new [illegible] and aeration plant has been presented by the chairman of the Baths and Markets Committee, and the baths superintendent (Mr. L. Folsom), in which it is stated—During the year we had deputations from Glasgow, Doncaster, Stalybridge, and Batley to visit our baths, all of whom were surprised with what they saw and quite satisfied with what had been accomplished. Two samples of water were taken by the medical officer (Dr. Halliwell), one in October last and the other in January, 1914, and they were sent to the county bacteriologist, and his reports were quite satisfactory, the water being stated to be highly suitable for bathing purposes. Considering the fact that the water had been repeatedly used, the examination shows a very considerable degree of purification."

Dunfermline T.C.—The council are seeking powers [illegible] the necessary land for the purpose of improving the water supply to the Rosyth area.

Eastbourne T.C.—A satisfactory report with respect to the electricity undertaking was submitted on Monday by Alderman Martin, chairman of the Electricity and Street Lighting Committee. The corporation, it was stated, purchased the property in 1899 for a high price, and they thought at first they had made rather a bad bargain, because the outfit was practically obsolete. Since then, however, they had renewed a great deal of the machinery, and they had also been reducing the cost of the light to the consumers by one-third, and the cost of manufacture something like 35 to 40 per cent. The nett profit for the year, after repayment of loans, amounted to £2,696, against £2,495 last year, while the reserve and renewal fund had reached £23,400.

Howden R.D.C.—The council on Saturday adopted the recommendation of Mr. Percy Griffith, M.INST.C.E., that a 12-in. diameter boring, lined with steel tubes, be made to a depth not exceeding 70 ft.; to insert a test pump therein, and if water is obtained to carry out a continuous test for twenty-one days at the rate of at least 5,000 gallons per hour.

Oswestry T.C.—The cost of the scheme to improve the borough water supply has amounted to £140 less than their original estimate, and the quantity of water brought to the town reservoirs has been doubled, notwithstanding an extremely dry season.

MISCELLANEOUS.

Cirencester U.D.C.—It has been decided to purchase from Messrs. Thornycroft & Co., at £562, a 2-ton motor vehicle for hauling purposes, with interchangeable bodies, including a 400-gallon tank, and adaptable for street watering.

Preston T.C.—It has been agreed to purchase two motor fire engines, one from Leyland Motors, Limited, and one from Merryweather's, Limited, at a cost of £1,200 each.

Torquay T.C.—The borough surveyor, Mr. H. A. Garrett, on Tuesday reported that the price for horse [illegible] and after July 1st would be increased by 1d. per ton, or an increase of from £200 to £300 per annum in his wages bill, which, added to the recently increased wages to labourers, masons, and [illegible], and a further advance to the labourers on January 1st next, would affect his wages bill to the extent of £400 to £600 a year. In view of the reduction in the amount allocated to the committees in his department, the estimates were bound to be exceeded.

Willesden U.D.C.—The council have accepted the tender of Leyland Motors, Limited, at £760, for the supply of a petrol motor lorry, constructed in accordance with the requirements of the War Office, thus carrying certain subsidies.

FOR OTHER ADVERTISEMENTS

See End of Paper.

FROME URBAN DISTRICT COUNCIL.

WATERWORKS.

SUCTION GAS PLANT, GAS ENGINE, AND VERTICAL THREE-THROW RAM PUMPS.

An additional clause to the advertisement which appears under the above headings on p. xviii. of this issue stipulates that applications for Form of Tender, &c., must be accompanied by a cheque for £2 2s., which will be returned upon the receipt of a *bonâ-fide* Tender and all other documents. (1,772)

HOWDEN RURAL DISTRICT COUNCIL. EAST YORKSHIRE.

TRIAL BORING AT SOUTH NEWBALD.

The Council are prepared to receive Tenders for the Construction of a 12-in. Trial Boring in the Parish of South Newbald, in the East Riding of Yorkshire, and for testing the yield of water therefrom. Copies of the Specification and Form of Tender can be obtained from the Council's Engineer, Mr. Percy Griffith, M.INST.C.E., F.G.S., 20 Victoria-street, Westminster, S.W., on payment of a deposit of Two Guineas (by cheque), which will be returned on receipt of a *bonâ-fide* Tender by the date named below. Sealed Tenders, endorsed "Tender for Trial Boring," to be delivered to the undersigned not later than Friday, the 24th July, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order of the Council)

HENRY GREEN,
Solicitor and Clerk.

Howden, East Yorks. (1,780)

BOROUGH OF COLCHESTER.

TENDERS FOR WOOD-BLOCK PAVING.

The Roads and Drainage Committee of the Urban District Council invite Tenders for the Laying of about 10,000 square yards of Wood-block Paving, partly on Cement Concrete Foundations, including the removal of existing granite sett paving, macadam, &c.

Specifications, Quantities, Conditions of Contract, &c., can be obtained at my Office on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Wood-block Paving," to be sent to me not later than 9 a.m. Wednesday, 29th July, 1914.

The Committee do not bind themselves to recommend the Council to accept the lowest or any Tender.

(By order)

HAROLD COLLINS, ASSOC.M.INST.C.E.,
Borough Engineer and Surveyor.

Town Hall, Colchester.
July 8, 1914. (1,779)

BOROUGH OF WORKINGTON.

The Corporation of Workington require the services of an experienced Road Foreman, and are prepared to receive applications from persons whose age must not exceed 45, and who must have a thorough experience in modern road construction and maintenance, including tar and bituminous bound roads, sewer construction, and all other duties which generally appertain to the office.

He must also be thoroughly experienced in the supervising and organisation of manual and team labour.

Preference will be given to candidates who have held a similar position under a Local Authority, and who are also able to cycle.

The salary will be £2 5s. per week.

Applications, in candidate's own handwriting, stating age, experience, present and previous appointments, accompanied by three recent testimonials, to be sent to the undersigned, endorsed "Road Foreman," by Tuesday, the 21st instant.

Canvassing will disqualify any candidate.

H. BOWMAN WILLIAMS,
Borough Engineer and Surveyor.

Town Hall, Workington.
July 8, 1914. (1,778)

LAND SURVEYORS required by Hong Kong Government. Three years; possible extension. Salary £330—£10—£350. Further increments to £420 if engagement extended. Travelling allowance 360 dollars per annum. First-class passages. Age 23—28, unmarried. Candidates with a thorough knowledge of surveying with the theodolite and level, who are neat draughtsmen and quick at figures, and capable of carrying out extensive surveys over rough, hilly country, and intricate surveys of city lots covering large areas of steep hill-side land, and who are also proficient in checking and closing traverses by co-ordinates, preparing plans and sections, and computing areas, should apply at once to the Crown Agents for the Colonies, Whitehall-gardens, S.W. (1,781)

PERSONAL.

Mr. [illegible], [illegible], has been appointed assistant surveyor to the Sleaford Urban District Council.

Mr. H. G. Watts, of Faringdon, Berks, was on Wednesday appointed surveyor to the Kingswood Urban District Council.

Mr. [illegible] Ball, of the county surveyor's department, Shire Hall, Dorchester, has been appointed [illegible] to the roads surveyor of West Suffolk.

Mr. Francis J. Wright, borough surveyor and inspector of Okehampton, has been appointed surveyor [illegible] to the Bude and Stratton Urban District Council.

Mr. F. R. Gibbins, of the city surveyor's office, Manchester, has been appointed assistant and surveyor to the Cheadle and Gatley Urban District Council. Previous to going to Manchester, Mr. Gibbins was for six years assistant to Mr. G. W. Holmes, engineer to the Walthamstow Urban District Council.

Mr. T. Waddingham, surveyor to the Hebden Bridge Urban District Council, who, as previously stated, has resigned on account of hoarseness at Grimsby, has been presented with a testimonial, passed unanimously by the council, expressing high appreciation of the conscientious service he rendered as surveyor and waterworks engineer during his term of office, upwards of eight years. Three councils, it may be stated, had previously given Mr. Waddingham testimonials under seal.

Mr. Albert E. Brookes, county surveyor of Cornwall, whose appointment as county surveyor of Durham has been confirmed by the Durham County Council, is 44 years of age. He is a native of Lancashire, and began his career as articled pupil and assistant to Messrs. Firth & Sheldon, of Macclesfield, and from 1890 to 1896 acted as divisional surveyor of main roads to the Hertfordshire County Council. In the latter year he was appointed chief assistant county surveyor of Worcestershire, and in

Mr. Albert E. Brookes.

1907 he obtained the position of county surveyor for the Western Division of Cornwall, succeeding to the surveyorship of the whole county in 1911. He has had a large and varied experience in all branches of county work, and in the promotion schemes requiring Parliamentary, Local Government Board, and Board of Trade sanction. Recently he has prepared an important scheme for maining about 70 miles of district roads in Cornwall, and dismaining some existing main roads, which has been adopted by the county council, and is now under the consideration of the district authorities concerned. His progressive policy commended itself to both the Main Roads Committee and the county council, and he was successful in obtaining extensive reforms in organisation and administration under circumstances of considerable difficulty.

THE ROAD BOARD.

GRANTS TO HIGHWAY AUTHORITIES: FIFTEENTH LIST.

During the months of April, May and June, 1914, the Road Board indicated additional advances to highway authorities amounting in the aggregate to £340,112, of which £277,357 was by way of grant and £62,755 by way of loan.

The total advances made and indicated up to June 30, 1914, amount to £5,553,924—£4,106,462 by way of grant and £1,447,462 by way of loan.

The formal advances by way of grant made, with the approval of the Treasury, during the last quarter, amounting to £267,426 were applied as follows:—

Road crust improvements	£231,753
Road widenings and improvement of curves and corners	24,016
Road diversions	5,125
Reconstruction and improvement of bridges	6,542
New roads and bridges	1,000

During the same period advances by way of loan amounting to the sum of £105,266 have been arranged.

County or County Borough.	Amount of grant for			
	Improvement of road-crusts.	Road widenings, corners and diversions.	New roads and bridges and reconstruction of bridges	Total.
	£	£	£	£
England.				
Bury (C.B.)	2,000	—	—	2,000
Cumberland	8,156	—	—	8,156
Devon	—	—	552	552
Dorset	787	—	—	787
Durham	1,625	596	—	2,221
Essex	250	—	—	250
Gloucester	21,500	—	—	21,500
Great Yarmouth (C.B.)	1,500	—	—	1,500
Huntingdon	8,000	—	—	8,000
Isle of Ely	163	—	—	163
Kent	18,997	9,879	1,016	29,892
Lancashire	20,074	1,926	3,000	26,000
Leicester	3,537	—	—	3,537
Lincs (Holland)	8,000	—	—	8,000
Lincs (Kesteven)	60	—	—	60
London (Area of the Metropolitan Police District)	7,068	819	—	7,887*
Nottingham	—	104	—	104
Norfolk	8,374	1,000	—	9,374
Northampton	500	—	—	500
Northampton (C.B.)	3,000	—	—	3,000
Rotherham (C.B.)	1,000	500	—	1,500
Rutland	641	—	—	641
Somerset	12,500	1,210	—	13,710
Staffordshire	14,755	5,376	1,450	21,581
Suffolk (East)	9,200	—	—	9,200
Suffolk (West)	7,400	225	—	7,625
Surrey	—	76	—	76
Westmorland	—	1,283	78	1,361
Wilts	1,001	—	—	1,001
Wales.				
Anglesey	429	1,027	—	1,456
Denbigh	40	—	—	40
Glamorgan	—	2,174	400	2,574
Merioneth	28	—	—	28
Scotland.				
Argyll	5,210	1,466	—	6,676
Ayr	624	128	—	752
Berwick	—	250	—	250
Dumfries	1,223	—	—	1,223
Dumbarton	150	—	—	150
Elgin	793	—	—	793
Fife	1,173	—	—	1,173
Forfar	4,695	—	—	4,695
Haddington	1,019	—	—	1,019
Kinross	114	—	—	114
Kirkcudbright	100	—	—	100
Lanark	1,210	200	46	1,456
Midlothian	7,400	—	—	7,400
Orkney	250	—	—	250
Peebles	656	—	—	656
Renfrew	2,646	—	—	2,646
Ross and Cromarty	667	60	—	727
Stirling	2,571	—	—	2,571
Wigtown	200	—	—	200
Ireland.				
Armagh	1,676	—	—	1,676
Cavan	1,266	—	—	1,266
Clare	6,749	—	—	6,749
Donegal	10,000	—	—	10,000
Down	5,380	—	—	5,380
Kilkenny	127	—	—	127
Kings	1,200	—	—	1,200
Leitrim	1,023	—	—	1,023
Limerick	4,069	—	—	4,069
Monaghan	3,577	—	—	3,577
Queen's	3,096	—	—	3,096
Roscommon	1,790	—	—	1,790
Tipperary (S.R.)	671	—	—	671

* This amount of £7,887 is made up as follows:—Beckenham £1,100, Hestonand Isleworth £500, Kensington £750, Mertonand Morden £1,500, Penge £438, St. Pancras £1,700, Stepney £475, Wimbledon £600, Woolwich £819.

Royal Sanitary Institute.

ANNUAL CONGRESS AND EXHIBITION AT BLACKPOOL.

Nearly one thousand delegates from all parts of the United Kingdom are attending the twenty-ninth congress of the Royal Sanitary Institute which opened on Monday at Blackpool. The Mayor of Blackpool (Councillor J. Dewhurst) who was accompanied by the Mayoress and Lord Derby (the president of the congress) and a number of members of the corporation, received at the Hotel Metropole those attending the congress, and presided at a luncheon which followed. Subsequently, at the Grand Theatre, Lord Derby delivered his presidential address, Sir Henry Tanner, chairman of the council of the institute, presiding.

At the luncheon, Councillor J. Collins, J.P., in proposing the toast of "The Royal Sanitary Institute," said the value and importance of the work of that body must command the respect and support of all who were interested in the matter of public health. Things were once in a deplorable condition, and so recently as thirty-four years ago it was necessary to found that institute to remove many of the evils which were then adding to the death-rate. The objects of that institute were not local, nor even national, for the sphere of usefulness extended to Canada, India, British South Africa, Australia, New Zealand, and other countries.

SIR HENRY TANNER, in replying to the toast, expressed cordial thanks to the Corporation of Blackpool for the generous manner in which they were entertaining the delegates, and for the excellent arrangements made for their comfort and well-being.

MR. EDWIN T. HAYLL, F.R.I.B.A., in proposing the toast of "The Mayor and the Corporation of Blackpool," spoke of the growth of Blackpool, mentioning that it was not shown on the ordnance map of 1847, and, referring to the corporation enterprise, said that out of a sand heap had been raised a city of palaces. In 1800 the population was only 500. That was 114 years ago, and it was curious to note that during that time the population had increased 114 times. The town had increased its population five times within the past thirty-three years.

In replying, Alderman HAMPSON observed that the institute were engaged in a very important work, and were entitled to all the assistance that could be given from municipal authorities.

PRESIDENTIAL ADDRESS.

Lord Derby chose for the subject of his presidential address the Health of the Army as a Factor in the Health of the Nation at Large. His LORDSHIP said he was very glad that the congress was being held in this part of Lancashire, because he felt perfectly certain that the delegates would find in the towns of Lancashire that everything possible was being done for the inhabitants, and that everybody in authority was willing to learn to do more if necessary. In addition to that, the delegates would find no more health-giving places than the towns on the Lancashire sea coast, at whatever time they paid a visit.

A vote of thanks was passed to Lord Derby for his address.

CONFERENCE OF ENGINEERS AND SURVEYORS.

The conference of engineers and surveyors to councils, and other sanitary authorities was held on Tuesday morning, under the presidency of Mr. J. S. BRODIE, M.INST.C.E., Borough Engineer and Surveyor of Blackpool.

In his opening address Mr. Brodie observed that the outstanding subjects of the past year of greatest interest, not only to municipal engineers and surveyors, but also to the general public who are interested in municipal government, had been *(a)* The construction and maintenance of highways; *(b)* Housing and town planning; *(c)* Water supply; *(d)* Sewage disposal; and *(e)* Labour unrest in municipal service.

HIGHWAY ENGINEERING.

The Third International Road Congress held in London last year was an event of first-rate importance in regard to roads and road-making in this country, and the voluminous report of the proceedings of the congress, just recently received, would form a most valuable addition to their knowledge of the subject, and a most useful form of reference for road surveyors and public authorities in charge of highways in the future.

So far as could at present be seen, some form of macadamised road surface, bound with bituminous or asphaltic materials, instead of with water, will be the road surface of the future for moderate amounts of traffic, and it was satisfactory to them, as sanitary engineers, to note one of the "particular conclusions" arrived at by the congress, namely: "That sufficient information is now available to enable engineers to select and specify bituminous binders which will have no prejudicial effect upon public health, fish life, or vegetation; but which, on the contrary, will conduce to conditions of considerable hygienic advantage."

Another conclusion arrived at by the congress was: "That subject to certain precautions, such as impregnating of the wood, waterproofing of the joints and surface, frequent cleaning of the roadway, &c., there is no objection to wood paving from a sanitary point of view." That conclusion was especially interesting to Blackpool, inasmuch as there was probably a greater percentage of wood pavement there than in any other British town.

HOUSING AND TOWN PLANNING.

From a memorandum recently issued by the Local Government Board, it appeared that for the year ending December 31st last the results of the operations of sanitary authorities under the Housing and Town Planning Act, 1909, were as follows: 30,707 houses were reported against, 18,407 houses were made fit for habitation without closing orders, 2,116 houses were closed or demolished voluntarily, 10,695 closing orders were made, 1,550 houses were demolished after the issue of closing orders, 2,193 demolishing orders were made, also that for the three years ending March 31st, 1913, 129,620 houses had been made fit for habitation at the cost of the owners, and that for the five years ending on the same date the board had sanctioned loans amounting to £1,403,969 for the erection of 6,356 houses, at an average of £220 per house.

As regards the progress of town planning under the same Act, the following are the results reported by the board up to December 31st: Two schemes had been finally approved by the board of an area of 3,762 acres. Three schemes had been prepared and submitted of an area of 6,503 acres. Forty-seven schemes had been authorised to be prepared or adopted by local authorities of an area of 70,900 acres, and fourteen applications for authority to prepare schemes were under consideration by the board of an area of 29,761 acres.

During the four years that the Town Planning Act has been in operation it had been found that the procedure, especially in regard to work required to be done before even an application to the board for authority to prepare a scheme could be made, was altogether too elaborate and irksome, and consequently the board had recently issued amended town planning procedure regulations whereby the preliminary work, especially in the preparation of maps, had been simplified without sacrificing any necessary safeguards. It was to be hoped that the result of these amended regulations would be materially to speed up progress in town planning in the immediate future.

On the more practical side of the subject of town planning might be noted the commencement during the past year of the actual laying out of the new capital of India, on the southern site closely adjacent to the ancient imperial city of Delhi, as recommended by Messrs. Swinton, Brodie, and Lutyens, also the adoption in principle by the Government of Australia of the plan prepared by Mr. W. B. Griffin, of Chicago, for laying out the proposed new capital city of the Commonwealth, which was awarded the first prize of £1,750.

It was also satisfactory to find that in our own

[illegible] the city of Birmingham has got its two [illegible] [illegible] and has actually [illegible] [illegible] in its [illegible] waterworks.

WATER SUPPLY.

In the matter of public water supplies the new [illegible] as an artificial supply of 500 million gallons a day for the city of New York from the Catskill Mountains, a distance of 120 miles, at a cost of 40 millions of pounds sterling, certainly created a world record.

In the [illegible] Islands the question as to dealing with public water supplies as a whole, instead of each community rushing to be first in the field to secure its own particular requirements, was coming more and more to the front, and it was to be hoped that before very long public opinion would move more quickly towards legislation in this direction.

A [illegible] suggestion was made in a recent memoir of the geological survey staff to the effect that deep wells from which water was pumped might be artificially replenished by rain-water falling on impervious surfaces being drained into dumb wells sunk through the impervious stratification into the water-bearing strata below, from which the pumped water supplies were obtained.

A great [illegible] to public water authorities was the comparatively short-period loans allowed by the Local Government Board for reservoir construction. The only way to overcome that was in the increasing use of reinforced concrete construction, by which the first cost of the work was so much reduced that there was no extra burden in meeting repayment of loans for the shorter period, and the great advantage of the loan being repaid altogether in much shorter time.

SEWERAGE AND SEWAGE DISPOSAL.

As in the case of public water supplies, so, in a lesser degree, in that of sewerage schemes, an enormous saving in cost, with much greater efficiency, would be attained if, instead of working in small units and within boundaries absolutely unsuitable for the best and most economical sewerage arrangements, larger combined areas, in which the watershed would be the unit, were adopted. In the latter case provision could be made for the future at a tithe of the cost entailed in each little district working out its own tiny scheme, regardless alike both as to its neighbours and the future.

A good example of the "better way" was seen in the combined scheme for the sewerage of Rochester and Chatham, under Mr. Radford, now being carried out at an estimated cost of £300,000.

The issue by the Royal Commission on Sewage Disposal of their eighth report with the appendix thereto in the autumn of last year, relaxing the general standard for sewage effluents under special conditions, necessitated a restatement of our conclusions on this important subject. It now appeared that special standards might be desirable "as local circumstances require or permit," and that where sewage was discharged into a stream where there was a dilution of from 150 to 300 volumes of water to 1 volume of sewage, the latter must not contain more than three parts per 100,000 of suspended matter; if the dilution was as much as from 300 to 500 to 1, then the effluent might contain as much as fifteen parts per 100,000, and lastly, if the dilution is 500 to 1 and upwards then the sewage might be discharged in its crude state without further treatment than by screens or detritus tanks. It must, however, be kept in mind that the diluting water in the stream or river must itself be of a standard quality of purity under the suggestions made by the commissioners.

MUNICIPAL LABOUR UNREST.

Two strikes among workmen engaged on municipal service had occurred during the past year, one at Leeds and another at Blackburn. Much inconvenience to the community, danger to the public health, and serious financial loss had been sustained in both towns.

In the case of Leeds it had been found necessary, in order effectually and successfully to cope with such an abnormal state of things, to set up for the time being a kind of council of war, consisting of a committee of seven aldermen, with a commander-in-chief in the person of the tramways manager, in order that, as regarded labour, the several departments of the city corporation might be adequately organised and correlated successfully to meet the enemy in the shape of the men's unions. It was possible that, while going so far, the City Council of Leeds had not gone far enough, and that the end in view would be more certainly accomplished if the council appointed the chairman of the City of Dayton, Ohio, [illegible] appointed, for nine years, a City Manager, who would be the executive head of the municipal government, responsible for the efficient working of all the departments, with power of appointing and removing all subordinate officers, and carrying on the business and needs of the city. These experiments in municipal administration should be watched with interest both in this country and America, although not unknown on the Continent, they were a somewhat novel departure in democratic English-speaking communities.

In addition to the leading features of municipal engineering, as lightly touched upon in the foregoing remarks, there were other departments of scarcely less importance. In regard to the collection and disposal of house refuse, it was really a disgrace to us, in this mechanical age, that we had not yet evolved a more satisfactory method of house-refuse collection than by calling at each separate house with a dustcart and a couple of grimy workmen. Again, in the matter of disposal, the method of burning was certainly the easiest and the most efficacious, as regarded the prevention of an offensive nuisance; but it could not be denied that the system of disposing of house-refuse by converting it into a valuable fertilising manure was less wasteful, and therefore more truly scientific, than by burning.

"And now, in drawing these few remarks to a close, may we venture," said Mr. Brodie, "as humble workers in applied sanitary science, to attempt to peer just a little into the future? A distinguished living writer has told us that 'the scientific process is not a marketable conjuring trick, but is, in reality, the gift of prophecy.' May we therefore, in the true spirit of scientific optimism, discern the approaching time when all highways will be clean, noiseless, non-slippery, and well-lighted, when every man, however poor, will, if he cares to, be the owner of his own comfortable home; when all towns and villages will have wide, beautiful, tree-shaded streets; when every cottage, however much isolated in the country, will have an abundant supply of good and pure water, adequate drainage, and pure fresh air; when heat and light will be laid on to every dwelling house in the shape of a gas, a liquid, or an electric current, and coals and coke will be unknown articles near the habitation of man; when house-refuse will be removed from each house by means of pipes or tubes, as sewage is at present, and used to replenish the earth from whence it came? When these scientific forecasts, or prophecies, have come to pass (and they are now visible to the eye of faith), then shall we municipal engineers and surveyors feel that our efforts in 'directing the forces of Nature for the use and convenience of man' have not been in vain."

Mr. E. G. Mawbey, borough engineer of Leicester, proposed a vote of thanks to Mr. Brodie. Knowing as they did that Mr. Brodie occupied a place in the front rank of municipal engineers, they had expected to hear a good address from him, and had got one. It was characteristic of him that whatever he undertook he did well, and he was sure they would all admit that his address was exceedingly instructive and suggestive. It bristled with information which it was very helpful to have—on the up-to-date sanitary engineering works that were going on at the present day. There were some fine examples of engineering work in Blackpool, and Mr. Brodie had stamped his name, energies and ability on the town.

Mr. C. Brownridge, borough engineer of Birkenhead, seconded, and the vote of thanks was passed.

The conference then proceeded to the consideration of papers.

(To be continued.)

HEALTH EXHIBITION.

If not of a very extensive character, the Health Exhibition which is being held in connection with the congress contains much of interest to sanitarians. There are some fifty stands, and several well-known firms engaged in the supply of apparatus and material for municipal and public works purposes are among the exhibitors. The exhibition, which is housed in the old skating rink, was formally declared open on Saturday by the mayor (Councillor Dewhurst), who aptly pointed out that it would serve as a practical illustration of the subjects to

be discussed at the congress, while at the same time bringing questions of health and sanitation before a large number of people who were not attending the meetings. The exhibits illustrated many sides of public health work, from large appliances suitable for municipal politics down to the various sanitary fittings of the house and home, and even smaller matters relating to personal health and comfort.

ROWE BROS. & CO., LIMITED.

One of the largest stands in the exhibition is that in the occupation of Messrs. Rowe Bros. and Co., Limited, City Lead Works, Liverpool. "Rolex" and "Labrex" baths are an assortment of bathroom fittings, lavatory basins, and school or workshop lavatory ranges, and a variety of pedestals and seats make up an excellent display.

JONES & ATTWOOD, LIMITED.

Working models of the Feddan and J. and A. patent sewage wheel distributors are a striking feature of the exhibit of Messrs. Jones & Attwood, Limited, of Stourbridge. The models in question illustrate the application of the "sewage wheel" to both circular and rectangular beds. It will be remembered that an article appeared in THE SURVEYOR of last week, in connection with the important installation of this firm's distributors at Chelmsford, and their advantages were set out as follows: "No small holes are employed, the edges of the water-wheel buckets throwing off the liquid in fine drops over the whole filter surface in very small doses, and at any rate of flow, while the feed weirs allow of exact adjustment to give even distribution over all parts of the filter at any varying rate of flow. Heating apparatus for domestic hot water supply forms another important branch of Messrs. Jones & Attwood's work, and at Blackpool they are drawing attention to their patent "Batheater" boiler and circulating cylinder combined, for fixing in kitchen or scullery. This is designed specially for use with hard waters containing much sediment. The cylinder can be easily removed, exposing the whole interior of the boiler and cylinder so that every portion can be thoroughly cleaned, thus prolonging the life of the boiler. The complete Patent "Batheater" has a sheet-steel outer casing, lined with silicate cotton non-conductor, which conserves the heat of the water over a long period. The fire-opening has a removable grate, which affords easy lighting and cleaning, and when the door is open the advantages of an open fire are obtained.

PATENT LIGHTNING CRUSHER COMPANY, LIMITED.

Photos and drawings of the patent lightning dust manipulator and crusher of this firm—whose offices are at 14A Rosebery-avenue, Grays Inn-road, London, E.C.—fill one of the wall spaces in the exhibition. In our special annual issue in January last we reported that the company's system of disposing of house-refuse by converting it into manure seems to meet with increased favour at the hands of municipal councils. Up to six months ago over 100,000 tons of refuse converted by the dust manipulators at Southwark had been sold by the borough council; and operations on an equally extensive scale are being carried on by public authorities in Lancashire, Yorkshire and other counties. It is claimed for the machines, and from what we know of their working not without justification, that they get rid of the house-refuse nuisance altogether, while at the same time effecting a considerable saving to the bodies which adopt them.

SILENT FLUSHING CISTERNS, LIMITED.

The "Mute" is the appropriate name given to the flushing cisterns manufactured by this firm, the action of the apparatus, as the name implies, taking place with a remarkable freedom from noise.

EDWARD WOOLLEY.

Mr. Edward Woolley, Canal Foundry, Church, near Accrington, Lancs, has an interesting display of street name plates, notice plates, road direction posts and plates, manhole and inspection covers, gully grates, and ornamental standards and chains.

"FIRMIT" FLOORING CO., LIMITED.

This firm, whose works are at 17 and 20 Birley-street, Blackpool, exhibit their "Firmit" jointless flooring and "Lilywhyte" marble wall covering.

STOURBRIDGE GLAZED BRICK & FIRE CLAY CO., LIMITED.

The "Gravi-sede" flushing system is among the exhibits of this well known Dudley firm. With this system there is only one ball valve to a whole range of closets, no matter how many closets there are on the range. Each cistern is directly connected with a full pressure from the main supply. The whole system can also be drained perfectly dry, which is often necessary for schools during winter holidays. Mention may also be made of a special closet set produced to meet the requirements for various authorities for conversion work. The closet pan is made with a flat back to fit up against the wall, and can either be supplied with side pads or hinged seat as required.

WEBB LAMP CO., LIMITED.

The Webb Lamp Company's patent sewer ventilating lamp is shown in operation, with air-meter attached, indicating the amount of work done. The firm's non-return inlet ventilators for sewers and sewage tanks, silt dredgers, drain cleaning tools and an assortment of fire extincteurs also find a place on the stand.

BRISTOWE & CO., LIMITED.

Messrs. Bristowe & Co., Limited, 11 Tothill-street Westminster, are showing samples of trass and pumice gravel. A natural volcanic material which contains the highest siliceous properties of puzzolana, trass is claimed to impart greater strength and flexibility to concretes and mortars, and to be especially valuable when the latter are used in sea water. It can be employed with pure or hydraulic lime, and produces a highly impervious and durable concrete. The firm's pumice gravel is described as being admirably adapted for all purposes for which concrete breeze has formerly been used, and as possessing none of the disadvantages of the material. It has a low power of absorption, and will stand a high compressive strain, and may be said therefore to be peculiarly adapted for sewage contact and filter beds. The various uses of "Tarvia" are illustrated by samples of that material, and the attention of visitors to the exhibition is also being drawn to the "Cantar" road tarring machine, for which Messrs. Bristowe and Co. are the sole agents and manufacturers. Their No. 1 machine, it may be mentioned, has a capacity of 75 gallons, and is capable of supplying sufficient tar or tar compound heated to a temperature of 200 deg. Fahr. to spray 3,500 super. yds. of road surface per day, provided the fire has proper attention. The spraying apparatus is likewise adapted to deal with this quantity in an ordinary working day, and is fitted with pump filter, thermometer, pressure gauge (to ensure the same quantity being applied throughout), balanced swivel boom or hose carrier, 21-ft. flexible hose, and mono wheel or scythe sprayer fitted with three jets. The machine is fitted with a patent removable firebox, by which means the temperature of the tar can be readily controlled without raking out the fire, and should the liquid have a tendency to rise through heating the firebox can be easily withdrawn, and thus avert danger. As a second precautionary measure the boiler has a fixed cover fitted with a sliding lid for filling purposes, and has stout angle irons across the top which are hollowed for the reception of a barrel.

DR. R. H. QUINE.

Improvements in ashbins are exhibited by Dr. R. H. Quine (per Sanataries Limited, Pendleton, Manchester), and are deserving of the notice of visitors to the exhibition.

WILLIAM BOBY.

The distinctive feature of the automatic water softener of Mr. Wm. Boby, Salisbury House, London Wall, E.C., which is on view, is the absence of reagent solution, the attention required taking the form of simply placing some powder in a circular box. A "Boby Patent Sterilising Apparatus" is also shown upon the stand. It has been designed for the treatment in bulk of water supplies containing organic and bacteriological impurities.

IMPROVED SANITARY APPLIANCES CO., LIMITED.

Adjustable cantilever water-closets are shown by the Improved Sanitary Appliances Company, Limited, Paradise-street, Birmingham. The advantages of these is that they can be set at any angle to suit the position of the outside perpendicular soil pipe.

An admirable loan exhibit is that arranged by the Blackpool Corporation Highways Department under the direction of the borough engineer, Mr. J. S. Brodie.

[illegible]

among surveyors who are not content to assume that [illegible] Board, having been embodied by that authority in the new edition of their General Directions and Specifications. [illegible] sample.

LIST OF AWARDS.

[illegible] are the following:—

SILVER MEDALS.

W. M. Applebee—Bevan light pedal pipe and [illegible].
William Boby—Water sterilisers.
British Sanitary Company—Earth closets.
[illegible] Company, Limited—Laboratory stoves.
[illegible] & Allwood, Limited—Rotary sewage wheel distributor.
[illegible] & Allwood, Limited—Drain and sewer testing and [illegible].
[illegible] Asphalte Paving Company, Limited—[illegible] asphalt.
[illegible] Patent Earth Closet Company, Limited—Earth closets.
Rowe Bros. & Co., Limited—Lead Piping.
Slack & Brownlow—Brownlow germ filters.
[illegible] Great Bean and Fire Clay Company, Limited—Gravisede flushing system.
[illegible] Limited—[illegible] radiometer.

BRONZE MEDALS.

"Austral" Window Balance Company, Limited—"Austral" window.
Blackpool and Flyde Cremation Society—Crematoria.
William Boby—Water sterilising apparatus.
Bristowe & Co., Limited—Robbins non-set plastic cement, Tarvia.
Cremation Society of England—Crematoria.
Gilmour Door Company, Limited—Hospital flush glazed door.
Improved Sanitary Appliances Company, Limited—Cantilever traps and branches for closets and sinks.
[illegible] & Allwood, Limited—"Bathwater" heater and circulating cylinder.
Edwin A. Mansfield & Co.—Blastless gas blow-pipe burners.
Edwin A. Mansfield & Co.—Wireless electric pipe locator.
Dr. R. H. Quine—Wall ashbin.
Renton, Gibbs, & Co., Limited—Hot and cold water mixing valves.
[illegible] Limited—"Renuk."
Rowe Bros. & Co., Limited—Baths, lavatories, and sinks.
C. Sands & Co., Limited—"Fumal" fumigator.
Silent Flushing Cisterns, Limited—"Mute" flushing cistern.
Stimex Gas Stove Company, Limited—Hot water circulator.
Stourbridge Glazed Brick and Fire Clay Company, Limited—"Clyro" closet.
Stourbridge Glazed Brick and Fire Clay Company, Limited—Special school closet.
Stourbridge Glazed Brick and Fire Clay Company, Limited—School drinking fountain.
Webb Lamp Company, Limited—"Galvo" fire extincteurs for motor vehicles. Sewer ventilating lamp.
Edward Woolley—The Climax ashbin door and frame.
Yates Bros. (Darwen), Limited—Painters' and plumbers' blow lamps.

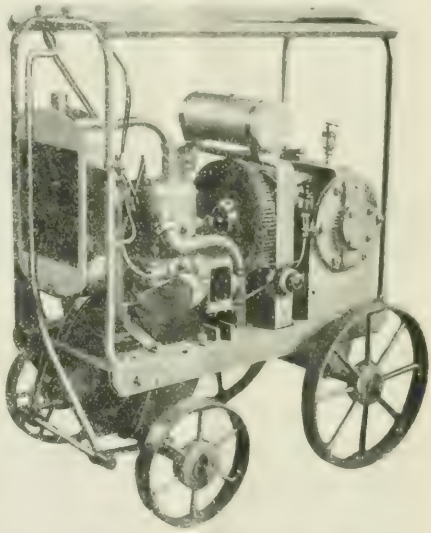
DEFERRED FOR FURTHER CONSIDERATION.

Fireproof Fibre Building Boards, Limited—Calvo sanitary building boards.

Firmity Flooring Company, Limited—Firmit jointless flooring.
Edwin A. Mansfield & Co.—[illegible] Patent Lightning Conductor Company, Limited—[illegible].
Stourbridge Glazed Brick and Fire Clay Company, Limited—[illegible].

CESSPOOL EMPTYING PORTABLE PLANT.

[illegible] Messrs. Norman Dickson, Pringle & Co., of Hunters Works, Bear Street, Cranwick, have supplied [illegible] connected a number of portable petrol-driven sets for doing work of this kind. The plant consists of a petrol "Ender" [illegible] pump, [illegible] gearing by a powerful petrol engine. The ignition is of the [illegible] and the engine is water-



"ENDER" CESSPOOL EMPTYING PLANT.

cooled with fan and radiator, the water circulation being on the "Thermo-syphon" system. A highly efficient silencer is fitted, and the whole is mounted on a substantial steel frame on cast-iron travelling wheels, and is entirely protected from the weather by a canvas canopy, supported on a strong frame. The pump is connected to a horse-drawn receiver (of, say, 500 gallons capacity), which is then exhausted to a high vacuum. On opening a valve, the material rushes into the receiver, filling it in a few minutes from the commencement of operations. The receiver is then drawn away and another is coupled up to the pump.

Any odorous gas passing through the pump is led into a brazier and consumed, while the pipe through which the matter from the cesspool passes can be cleaned by sucking fresh water from a bucket.

The makers inform us that they have supplied a large number of portable petrol-driven air pump sets to the Government, and that these plants are working all day long in crowded thoroughfares, showing that special attention has been paid to robustness of design and silence in running.

Surveyors who are desirous of installing apparatus of this class would certainly be interested in this well-made little plant.

Messrs. Norman Dickson, Pringle & Co. also manufacture fixed or portable power-driven pneumatic chasing tool sets, which are in some demand among builders and contractors for such purposes as chasing grooves in walls to receive electric wires.

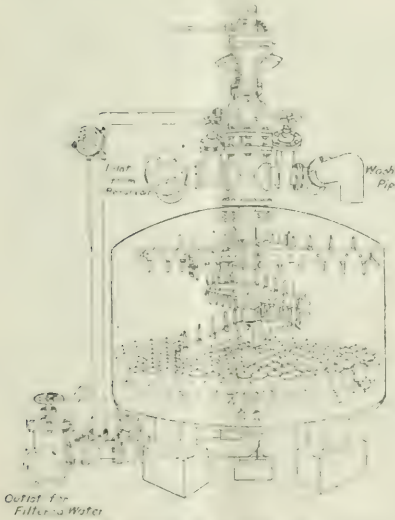
WATER SUPPLY AT STOCKPORT.

EXPERIENCE OF MECHANICAL FILTRATION.

A paper descriptive of the waterworks in his charge was prepared by Mr. Thomas Molyneux, Assoc. M.Inst.C.E., Corporation Water Engineer, Stockport, president of the Institution of Water Engineers, in connection with the recent annual summer meeting of that body. It appears that a portion of the Kinder-gathering ground is covered with a peaty deposit which at times affects the water considerably, and the installation of mechanical filters was decided upon.

There are three batteries of filters capable of filtering 3,750,000 gallons per day, each battery consisting of eight steel drums, each 8-ft. in diameter, and 4-ft. in height, charged with Leighton Buzzard sand, and capable of filtering about 1,000,000 gallons per day.

The water is delivered (by gravitation from the reservoir) into the top of the drums, and as it enters the filters it operates a series of motors which pump a standard aluminoferric solution in prescribed quantities into the raw water at the filter inlet. These motors are adjustable so that the quantity of the coagulant can be varied. The aluminoferric is dissolved in six rectangular tanks in the upper story of the annexe; from these tanks it gravitates through a ball valve into a small cistern fixed in the main building, from which it is drawn by the motor driven pumps.



SECTION OF FILTER AT KINDER WATERWORKS, STOCKPORT.

Lime, as lime-water, is also added to the water in proportions regulated by Venturi tubes as required, and measured by manometer. The lime, which is purchased, is guaranteed to contain 98 per cent. of Ca.O., is first slaked and then placed in four cylindrical drums 6-ft. diameter by 20 ft. high, one for each battery and one spare. Water passed upwards through the lime drums becomes a saturated solution containing 70 grains per gallon, and is then passed through Venturi tubes at the requisite rate.

The filters are washed once every 24 hours with filtered water from the adjoining filters, which passes the reverse way through the filters, the sand meanwhile being agitated by a series of arms on a vertical revolving shaft in each drum. These arms are hollow and have jets through which the water passes, thus thoroughly cleansing the sand. On the ends of the arms are extensions which scrape the sides of the drum to prevent the sand and any detritus which has crept down the sides from adhering and becoming foul.

The whole of the power for the plant is obtained from the compensation water.

The experience obtained with the plant, which has now been working since Sept. 1912, is summarised in the subjoined table:—

Date.	February 18, 1914.		March 24, 1914.		April 21, 1914.	
	Unfiltered.	Filtered.	Unfiltered.	Filtered.	Unfiltered.	Filtered.
Free ammonia	0·0010	0·0022	0·0168	0·0038	0·0010	0·0026
Alb. ammonia	0·0050	0·0011	0·0046	0·0016	0·0024	0·0024
Oxygen absorbed, 4 hrs. at 80° F.	0·152	0·020	0·148	0·020	0·160	0·028
Palmer's solvency at 24 hrs.	0·12	0	0·08	0	0·06	0
Bacteria per c.c. after incn. 72 hrs. at 37° C.	66	4	41	0	21	0

NOTE. Results expressed in parts per 100,000. The plant of the contractors' hands at the beginning of December 1914.

It must be borne in mind that these results were obtained with the water which first entered the new reservoir, and that, as there is no by-channel, the flood water passes through the reservoir, causing the supply to be very turbid at times, but even in these adverse circumstances the results were in every case satisfactory and the water supplied was bacteriologically, chemically and physically of excellent quality.

COTTAGE BUILDING IN RURAL DISTRICTS.*

By T. WICKFORD POLLER.

In estimating the cost of cottages at the various competitions and exhibitions which have been held so frequently of late it has been customary to give a figure which covers the nett cost of the actual building only; but as everyone knows, excepting some of those who have to pay, there are several expenses which have to be met before cottages can be occupied which should be reckoned as part of their cost. I particularly refer to water supply, drainage, paving paths, and fencing. Of course these items vary very considerably, but in building in towns they can be estimated for comparatively easily. I do not propose to give any figures (excepting they are of general application), as in very few cases can they be comparable one with another, but it may safely be reckoned that 20 per cent should be allowed for these necessities, and even then it largely depends upon the site and the stringency of the local by-laws.

Nearly all the model plans, many of which are excellent so far as they go, also make very little, if any, provision for outbuildings, and in the country these are almost as essential as living rooms. If the tenants do not find them they invariably proceed to erect something themselves, erections probably which are neither sightly nor advisable from a health point of view. They are a constant source of trouble both to a landlord who desires to preserve the amenities of the village, and to the rural district council who wish to administer their by-laws impartially, but to anyone who, living in the country, can enter into the cottagers' necessities, it does not seem to be an unreasonable requirement on the occupiers' part.

Air Compressors. Messrs. Alley & MacLellan, Limited, Sentinel Works, Polmadie, Glasgow, have issued a new compressor catalogue. The book gives dimensions, weights, prices, and fullest particulars of air compressors of capacities from 25 ft. to 25,000 ft. of free air per minute. In addition to this it includes in articles on air piping, air lift pumping, compressed-air forge hammers, drying air, cooling air, &c., an immense amount of practical data accumulated during the sale of over 2,000 "Sentinel" compressors.

* Extracts from a paper read at the Royal Sanitary Institute Congress at Blackpool.

TOWN PLANNING.

MR. THOMAS ADAMS AT THE CHELTENHAM CONFERENCE.

At the opening sitting of the Town Planning Section of the conference, held in connection with the annual meeting of the Institution of Municipal and County Engineers, Mr. Thomas Adams, of the Local Government Board, delivered an address on the conditions and principles.

Mr. Adams said that town planning had, of course, been taken somewhat late. They were faced with the fact that many of their towns were already developed, and they had only had [illegible] with questions relating to the undeveloped land. But it would be a mistake to be too general in the application of that theory, for a properly considered plan of a town must have definite relations to every part of that town. When they came to prepare their plans, although they could only apply a town planning scheme proper to their undeveloped land, every engineer who undertook his work properly took into consideration the width of existing streets, the number of buildings, and the probable need of widening the streets, and prepared his plans for suburban development in connection with the scheme for the whole city. They might not be able to include much in their developed scheme, but let them not accept the principle that land already built on could not be included.

It would certainly be necessary for them to make out a "case" to include for the Local Government Board, but, having done so, a large part of the land already built upon might form part of the area of the scheme. Engineers should work up their schemes as if they had power to deal with built-upon land, existing streets, and whatever they considered suitable before applying to the Local Government Board.

ARTERIAL ROADS.

The question of dealing with arterial roads was one to which engineers had to apply their skill. The arterial roads at Ruislip were 60 ft. wide, and that was a fair proportion to allow, considering that no contribution had been made by any outside authority. In that scheme the first onus of constructing a street rested upon the owner, but the authority had power to come in after one notice and construct a street and charge a proportion of the cost against the owner under the Private Street Works Act. The apportionment was to be arranged in accordance with the benefit that accrued from the property, and an instalment system might be adopted which enabled the owner gradually to redeem his property, the Local Government Board being the final arbiter on the question. That seemed to be a fairly good working arrangement, and it was hoped that in practice it would be beneficial to the owner and to the authority.

It did not yet seem to be realised how great was the advantage derived from putting in an application for sanction for a scheme when it had been decided to prepare one. The reason was that, under our Town Planning Act, there were, in the first stage, two very important powers given to local authorities. One was that under sec. 58 (2) no owner could claim compensation for anything that contravened the proposed scheme after the time that the Local Government Board received notice of its preparation. Another point was that, under sec. 59, with regard to compensation, the public authority could limit the number of houses to the acre and prescribe the height and character of the buildings if they could satisfy the Local Government Board that their requirements were reasonable. These two things together enabled authorities to exercise a certain amount of control over their district before their scheme was prepared. The only risk they ran was that if their limit of houses was regarded by the Local Government Board as unreasonable they would have to compensate the owner. But that risk was altogether negligible.

PROGRESS OF TOWN PLANNING.

Regarding the general progress of town planning, the number of schemes submitted so far was only six. It was desirable that local authorities should not hold up the preparation of their schemes too long, because an owner would want to know where he stood. But anyone who was preparing a plan for the future development of a city could not do it in a week, nor, perhaps, in a year. It took two or three years to settle questions with owners, and therefore there was no reason to be disappointed at the rate of progress, especially as 200 authorities were working out the first stage, and sixty-five of them had already applied to the Local Government Board for the preparation of ninety schemes, involving 142,000 acres. Last year there were fifty schemes before the Local Government Board, and this year ninety, so that considerable progress had been made. In London an area of about 1,000 square miles was earmarked, of which about 690 square miles were metropolitan.

He admitted that they had much to learn from what other countries were doing—both what to do and what not to do. Great, wide streets were hindrances to the development of a town. They had to learn that town planning ought to precede building development, and not to be suddenly thought of when building development was rapidly covering their suburbs.

SOME RECENT PUBLICATIONS.*

Modern Plumbing Practice.—Vol. i. An Account of Practical Lead-working and Plumbers' Materials. By J. Wright Clarke, M.R.S.I., and Walter Scott, A.R.S.I. Price 10s. nett. London: B. T. Batsford, Ltd.

This is the first volume of a work which is intended to form an exhaustive review of the plumber's craft. The whole will be completed in three volumes, each of which, however, is complete in itself, and can be purchased separately, the later ones dealing respectively with "Modern Sanitary Plumbing and Fittings" and "Practical Lead-working on Roofs." The conception of the work is due to the late Mr. J. Wright Clarke, who was for many years a most successful lecturer on plumbing and sanitary engineering at the Regent-street Polytechnic, and it is based upon his earlier book on "Plumbing Practice." The object of the author was to produce a standard comprehensive work covering modern plumbing practice in all its branches. Mr. Wright Clarke was an enthusiast who took no narrow view of his craft as regards either its importance or its possibilities, and it may be said at once that in the volume before us he has amply succeeded in carrying out his design so far as the particular subjects dealt with are concerned.

The volume opens with an elementary description of the metals used by plumbers, their origin, reduction, and manufacture into the forms used in the trade, but goes only so far as a working plumber ought to be informed. Some chapters are then devoted to casting lead into sheets and other forms in which it is used by plumbers. Neither lead-casting nor lead-burning have, so far as we are aware, ever been dealt with in a satisfactory manner in books on plumbing, and the fairly exhaustive section on the latter subject will doubtless be appreciated. A section has also been devoted to setting out the lines for, and making, pipe bends and elbows with the view to enabling the workman to appreciate the use of such lines, and thus avoid a useless waste of energy in partially preparing a piece of work and then placing it in its position to ascertain if it is being made to the proper shape. The chapters on making soldered joints are carried as far as possible; it is obvious that the skill necessary for the actual execution of such work can only be obtained by practice and not by studying written descriptions, a fact which the author wisely recognises. Lead-light glazing is another subject dealt with that will be found useful to practical plumbers, for the reason that they are frequently called upon either to make or repair such lights, especially in country places distant from towns.

The book contains an abundance of illustrations, which are not only exceptionally clear, but also very practical. We have no hesitation in recommending all who are in any way interested in the subject to become possessed of a book which is not only an excellent text book, but which also has permanent value as a work of reference.

Transactions of the Institution of Water Engineers.—Vol. xviii. Edited by Percy Griffith, M.INST.C.E., F.G.S., Secretary. London: St. Bride's Press, Ltd.

This volume contains the proceedings of the eighteenth summer general meeting held at Wakefield,

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

and the eighteenth winter general meeting held in London, together with a table of contents and a subject index to vols. I.–XVIII., and a name index to vol. XVIII. The papers included in the volume are "Underground Water Supplies in Yorkshire," by Prof. P. F. Kendall; "The Valuation of Waterworks Undertakings on Transfer to Municipal Authorities," by E. J. Silcock; "The Wakefield Corporation Waterworks," by C. Clemesha Smith; "Reservoir Storage in Relation to Stream Flow," by W. J. E. Binnie and H. Lapworth; "The Water Supply of Jersey," by A. J. Jenkins; "Animal Growths in Water-pipes," by S. C. Chapman; "Compulsory Returns by Water Undertakings," by J. Chisholm; "The Portland Urban District Council Waterworks," by R. S. Henshaw; "The Solubility of Carbonate of Lime and its Bearing on Certain Processes for the Treatment of Water Supplies," by W. T. Burgess; and "The Treatment of Plumbo-solvent Water by Means of Mechanical Filters," by F. J. Dixon.

Dilapidations and Fixtures. Seventh Edition. By Banister Fletcher and H. P. Fletcher, FF.R.I.B.A., Price 6s. 6d. London: B. T. Batsford, Limited.

In its seventh edition this well-known text-book has been revised and rewritten in the endeavour to bring it up to date, and all important recent decisions have been incorporated. The convenient method of tabulation which characterised former editions has been adhered to, and has been extended as far as possible. The subjects dealt with include covenants, nature and extent of dilapidations, method of taking dilapidations, surveyors, actions, powers of lessors, Agricultural Holdings Act, ecclesiastical dilapidations, forfeiture, fixtures and others. The last chapter contains a number of very useful questions and answers on points of practice. We need not say more than that the work is thoroughly up to the high standard which the profession has long since learned to expect from the authors.

Commercial Paints and Painting. By A. S. Jennings. Price 6s. nett. London: Constable & Co., Limited.

This book has been written primarily for the architect, engineer and property owner, and is intended to show how a thoroughly desirable job of painting in its many and varied applications may be done at a minimum cost consistent with good material and good workmanship. Having this purpose in view, the author does not deal either with the manufacture of materials or the methods of the actual application of the paint. Nevertheless the work is of a sufficiently practical character, and deals, *inter alia*, with materials, the economic value of paint, the paint most suitable for various surfaces, mixing and application, tools, defects, and specifications. The work forms one of Messrs. Constable's well-known "Westminster" series.

Building By-laws in Rural Districts. By Sir William Chance, Bart., M.A. Price 1s. 6d. cloth, 1s. paper. London: P. S. King & Son.

This little book contains, in the first place, the paper which the author read at a meeting of the British Constitution Association in December, 1913, and upon which we commented at the time. It is here followed by the text of a Bill on the subject which passed through the House of Lords in 1906, and a revised code of building by-laws applicable to rural districts. Circulars of the Local Government Board dealing with rural by-laws are included as an appendix.

The two latest of the popular series of Homeland Handbooks deal respectively with "Bexhill and Its Surroundings" and "Falmouth, Truro, and the River Fal." They are published at 6d. nett.

Roadmen Who are Farmers.—The Denbigh Rural District Council recently declined to raise their roadmen's wages from 18s. weekly. It was argued that most of the roadmen are also small farmers, and had time off for agriculture.

Humane Slaughtering Apparatus.—Mr. Wm. H. Eley, engineer and surveyor to the Newmarket Urban District Council, writes: "I shall be obliged if you will permit me to enquire through your columns if there are any urban districts in the country who compel by by-law the use of humane apparatus for slaughtering animals whose carcases are used for human consumption."

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.Inst C.E., Borough Surveyor and Water Engineer, Cheltenham.

EASTERN DISTRICT.

An Eastern District meeting will be held at Tilbury on July 25th.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future.

J. W. Dudley Robinson, B.Sc.(Lond.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

NORTHERN DISTRICT.

Meetings will be held at Alnwick on Saturday, July 18th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

SOMERSET SURVEYORS' ASSOCIATION.

A meeting of the above association will be held at the council room, Williton, on the 18th inst., at 2 o'clock.

Agenda.

(1) Minutes of the last meeting.
(2) Report of the Executive Committee (if any).
(3) Paper by Mr. Charles Durie on "Highway Administration in the Williton Rural District," and the Ackland Highway Act of 1885.

Lunch, 1 o'clock, at a convenient place adjoining (details not yet arranged).

Tea at close of the meeting

Mr. Jackman, building surveyor to the rural district council, has kindly promised to place on view two sets of plans of workmen's cottages proposed to be built for the rural council.

D. Edwards, Assoc.M.Inst.C.E.,
Hon. Secretary.

Taunton

Rubber Roadways and Floors.—In an address at the rubber exhibition which is being held in London Sir Henry Blake said he looked confidently to the substitution of rubber for wood in street paving, and that he anticipated rubber flooring for churches and public and private buildings on such a scale as would absorb all the rubber which could be produced either by Nature or art.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—July 11th.—Nantwich Urban District Council. £90 per annum.—Mr. A. E. Whittingham, clerk.

SURVEYOR AND INSPECTOR.—July 11th.—Hay Urban District Council. £100 a year.—Mr. Robert T. Griffiths, clerk, Hay, viâ Hereford.

ASSISTANT SANITARY INSPECTOR.—July 15th.—Highland District Committee of the Perth County Council. £100.—Mr. R. McNicoll, County Buildings, Perth.

BOROUGH ESTATE AGENT AND VALUER.—July 21st. Commencing salary £400 per annum.—Mr. H. Lee, Town Clerk.

BOROUGH SURVEYOR'S CLERK.—July 22nd. Commencing salary £75 per annum.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

SANITARY INSPECTOR AND SURVEYOR.—July 24th.—Great Berkhamsted Urban District Council. £250 a year.—Mr. Tiss Perry, clerk.

GENERAL FOREMAN.—July 25th.—Corporation of Dunfermline.—Mr. A. G. Spencer, town clerk.

ASSISTANT DRAINAGE ENGINEER. July 30th.—Madras Corporation, India. £33 6s. 8d. per month.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

COUNTY SURVEYOR. — July 31st. — Cornwall County Council. £600—£700.—Mr. Christopher L. Cowland, clerk, Bodmin.

CITY SURVEYOR.—August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

DISTRICT ENGINEER.—Public Works Department of the British Guiana Government. £300—£400 per annum.—Crown Agents for the Colonies, Whitehall Gardens, London.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

CHAPEL-EN-LE-FRITH.—July 24th.—Plans for cottages, for the Chapel-en-le-Frith Rural District Council. Premiums, ten, five, and two guineas.—The Clerk, Stockport.

REIGATE.—July 25th.—Designs for a police and fire station, for the Corporation of Reigate. Premiums 40, 20, and 10 guineas.—Mr. A. Smith, town clerk.

LONDON.—September 7th.—Designs for two new schools, for the London County Council.—The Clerk, Spring-gardens, London, S.W.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HEBDEN BRIDGE.—July 10th. For repairs to schools, for the Education Committee.—Mr. F. J. MacDonald, Education Offices, Sowerby Bridge.

GLASGOW.—July 10th. For the digging and reinforced concrete work, at Dalmarnock Bridge new electricity station, for the corporation.—Mr. W. W. Lackie, electrical engineer, 75 Waterloo-street.

WEST RIDING. July 10th. For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

CROYDON.—July 10th.—For the erection of a school, for the Education Committee.—Education Office, Katherine-street, Croydon.

NEWCASTLE-ON-TYNE. — July 10th. — For the erection of baths, for the corporation. — Property Surveyor, Town Hall.

MILFORD.—July 11th. For building eleven cottages, for the rural district council. Mr. S. Waters, clerk.

MIDLETON.—July 11th.—For the erection of twenty-five labourers' cottages, and for the completion of 193 other cottages, for the rural district council.—Mr. J. Stanton, clerk.

HALIFAX.—July 11th.—For the erection of a cable shed at electricity works, for the corporation.—Mr. J. Lord, borough engineer.

CORNWALL.—July 11th.—For the erection of a handicraft centre, for the Education Committee.—Mr. B. C. Andrew, architect, Biddick's-court, St. Austell.

SUNDERLAND.—July 11th.—For the erection of a training college and hostels, for the corporation.—Borough Surveyor.

HITCHIN.—July 13th.—For the erection of an isolation hospital, for the rural district council.—Mr. A. E. Passingham, clerk.

HAMPSHIRE.—July 13th.—For the extension of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

COVENTRY.—July 13th.—For the erection of two pump-houses at waterworks, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

BRIDGWATER.—July 13th.—For alterations and additions to school building, for the Higher Education Committee. Messrs. Samson & Coltharst, architects, 51 High-street, Bridgwater.

RATHDRUM.—July 13th.—For the erection of sixty-one cottages, for the rural district council.—Mr. P. W. Sheehan, clerk.

SALFORD.—July 13th.—For the supply of steel and concrete foundations, for the corporation. Borough Electrical Engineer.

DUNDALK.—July 14th.—For the erection of forty-six houses and contingent works, for the urban district council.—Mr. M. Sellars, surveyor, Town Hall.

HAMPTON.—July 14th.—For the extension of the isolation hospital, for the urban district council.—Mr. S. H. Chambers, surveyor.

CROYDON.—July 14th.—For the erection of a covered steel shed, for the corporation.—Borough Engineer.

MIDLOTHIAN.—July 14th.—For alterations at Loanhead Hospital, for the county council.—Mr. A. Murray Hardie, architect, 20 George-street, Edinburgh.

HAMPSHIRE.—July 14th.—For additions to a school and drainage work, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BARKING.—July 14th.—For the erection of workmen's dwellings, for the urban district council.—Mr. C. J. Dawson, architect, Clock House Chambers, East-street, Barking.

EDINBURGH.—July 14th.—For the erection of a public convenience and scavengers' muster-room, for the corporation.—Mr. A. H. Campbell, burgh engineer.

CROYDON.—July 15th.—For alterations and additions to school, for the Education Committee.—Mr. J. Smyth, clerk, Education Office, Katherine-street, Croydon.

KESTEVEN.—July 15th.—For additions and alterations to schools, for the Education Committee.—Mr. H. Donaldson, County Education Office, Grantham.

HONLEY.—July 15th.—For the erection of new council offices, for the urban district council.—Messrs. J. Berry & Sons, architects, 3 Market-place Huddersfield.

CLITHEROE.—July 15th.—For the erection of twenty-six cottages, for the corporation.—Mr. A. R. Bleazard, borough engineer.

LEEDS.—July 15th.—For constructional and paving works, for the Property Committee.—Mr. W. T. Lancashire, city engineer.

EXMOUTH.—July 16th.—For the supply and laying, 2,000 ft. cast-iron pipes, sluice valves, 10-in. cast-iron pipe line, 8-in. steel pipe line, and other necessary works, for the urban district council.—Mr. S. Hutton, engineer and surveyor.

DURHAM.—July 17th.—For bridge widening, for the county council.—Mr. W. Cooper, county surveyor, Shire Hall, Durham.

WEST SUSSEX.—July 18th, 28th.—For the erection of a school at Horsham, for the Joint Education Committee.—Mr. Hadyn P. Roberts, education architect, Thurloe House, High-street, Worthing.

HERTS.—July 20th.—For the enlargement of Byng-road county council school, Barnet, for the Education Committee.—Mr. Urban A. Smith, county surveyor, Hatfield.

SOUTHAMPTON.—July 20th.—For the partial reconstruction of Stoning Bridge, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

SOUTHAMPTON.—July 20th.—For the reconstruction and strengthening of four small bridges, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

PRESTON.—July 20th.—For the erection of market offices, weighbridges, and public conveniences, for the corporation.—Borough Surveyor.

YARMOUTH.—July 22nd.—For the erection of an elementary school, for the Education Committee.—Borough Surveyor.

WEST HAM.—July 23rd.—For the erection of dwelling houses, for the Port of London Authority.—Mr. C. R. S. Kirkpatrick, 109 Leadenhall-street, E.C.

NANTYGLO.—July 23rd.—For the erection of 101 workmen's houses, for the urban district council.—Mr. W. J. Davies, surveyor.

WINCHCOMB.—July 25th.—For the erection of six cottages, for the rural district council.—Mr. T. Malvern, architect, 21 Winchcomb-street, Cheltenham.

EXMOUTH, July 25th.—For the supply of creosoted timber piling, pile driving, sea defence works, drainage, and all incidental works, for the urban district council.—Mr. Samuel Hutton, engineer and surveyor.

WANTAGE.—August 3rd.—For the construction of six workmen's dwellings in three pairs, together with the construction of a sewer, house and surface-water drains, sinking a well, and erection of fencing, for the rural district council.—Mr. John W. Harris, engineer and surveyor.

GRANTHAM.—For the erection of two cottages, for the corporation.—Borough Surveyor, Guildhall.

Iron and Steel.

LANGPORT.—July 11th.—For the provision, laying, and jointing of cast-iron mains and fittings, and all necessary excavation and other works in connection therewith, for the rural district council.—Mr. J. Mathison, engineer and surveyor.

ST. PANCRAS.—July 13th.—For supplying and fixing a Cornish boiler at public baths, for the borough council.—Mr. C. H. F. Barrett, town clerk.

CHELMSFORD.—July 13th.—For the supply of cast-iron pipes for water mains, for the corporation.—Mr. G. Melvin, town clerk.

SAMFORD.—July 14th.—For supplying and laying 2,000 yds. of 4-in. cast-iron water main, for the rural district council.—Mr. H. J. Wright, architect, 4 Museum-street, Ipswich.

LONDON.—July 16th.—For the supply and erection of steel and iron work at Battersea, for the Metropolitan Water Board.—Engineer, Savoy-court, Strand, W.C.

FROME.—July 23rd.—For the supply and erection of a suction gas plant, gas engine, and vertical three-throw ram pump on foundations which will be provided at the water pumping station, for the urban district council.—Mr. F. W. Jones, Public Offices, Frome.

TENDRING.—July 27th.—For the supply of 2,190 yds. of 3-in. cast-iron water main, for the rural district council.—Mr. S. Francis, engineer, Town Hall Buildings, Clacton.

Roads.

BARNSTAPLE.—July 10th.—For steam rolling and scarifying, for the corporation.—Mr. E. Y. Saunders, borough surveyor.

INVERURIE.—July 10th.—For the construction of concrete pavement and granite kerb, for the corporation.—Mr. J. Milne, burgh surveyor.

DUNSTABLE.—July 10th.—For the supply of broken stone, stone dust and tar macadam, for the corporation.—Mr. W. F. Wilkins, borough surveyor.

ABERYSYCHAN.—July 11th.—For road improvement and sewerage, for the urban district council.—Mr. E. Whitwell, surveyor.

ST. HELENS.—July 13th.—For granite paving work, for the corporation.—Mr. A. W. Bradley, borough engineer.

BROADSTAIRS.—July 13th.—For the supply of a 10-ton steam roller with scarifier, for the urban district council.—Mr. H. Hurd, surveyor.

ROMFORD.—July 13th.—For the supply of blue Guernsey granite, for the rural district council.—Mr. G. Lapwood, highway surveyor.

BLANDFORD.—July 13th.—For tar-spraying 20,000 sq. yds., more or less, of road surfaces, for the corporation.—Mr. P. C. Woodhall, borough surveyor.

BROMLEY.—July 13th.—For the supply of 3,500 cub. yds. of broken stone, for the corporation.—Mr. F. H. Norman, town clerk.

BLACKBURN.—July 13th.—For making up certain streets, for the corporation.—Mr. W. Stubbs, borough engineer.

WHITLEY.—July 13th.—For road widening and laying "Durax" paving, for the urban district council.—Mr. A. J. Rousell, surveyor, Whitley Bay.

KENSINGTON.—July 13th.—For road diversion and widening, for the borough council.—Borough Engineer.

SOUTHALL-NORWOOD.—July 14th.—For road works, for the urban district council.—Mr. Reginald Brown, engineer and surveyor.

CAERLEON.—July 14th.—For the supply of limestone, kerb, channel, and paving, for the urban district council.—Mr. C. J. Fox, surveyor.

TOTTENHAM.—July 14th.—For making up Southgrove (part of), for the urban district council.—Mr. W. H. Prescott, surveyor, Town Hall, Tottenham.

ST. MELLONS.—July 15th.—For widening and improving a road, for the rural district council.—Mr. Gomer S. Morgan, engineer, Pontypridd.

WELLINGTON.—July 15th.—For the supply of tarred macadam and broken granite, for the urban district council.—Mr. G. Riley, surveyor.

CHELMSFORD.—July 15th.—For paving Duke-street with creosoted deal blocks, for the corporation.—Mr. P. T. Harrison, borough engineer.

GLAMORGAN.—July 15th.—For main road improvement, for the county council.—Mr. T. Mansel Franklen, clerk, County Hall, Cardiff.

CONWAY.—July 15th.—For road construction, for the corporation.—Mr. A. Delamotte, borough engineer.

WANSTEAD.—July 15th.—For work of road improvement, for the urban district council.—The Surveyor.

SHEFFIELD.—July 16th.—For asphalting work, for the corporation.—City Architect.

LEEDS.—July 16th.—For works of paving and flagging, for the corporation.—Town Clerk.

BAKEWELL.—July 17th.—For hiring two steam rollers, with scarifiers, for approximately six months, for the rural district council.—Mr. M. Mann, surveyor, North District, Foolow, near Sheffield.

ARGYLL.—July 18th.—For road repair, widening, and improvement, for the Cowal District Committee.—Messrs. W. & W. Disselduff, joint district clerks, 160 Argyll-street, Dunoon.

MONMOUTHSHIRE.—July 18th.—For the construction of a new road, for the county council.—Mr. W. Tanner, county surveyor, Newport, Mon.

MARGATE.—July 20th.—For the supply of 1,500 tons of unbroken pit flints, and 1,000 tons of 2-in. broken and sifted pit flints, for the corporation.—Mr. E. A. Borg, borough surveyor.

GRANTHAM.—July 20th.—For [illegible] and [illegible] Mr. W. W[illegible]

WITHAM.—July 20th.—For [illegible] Mr. W. T. P[illegible] Lincoln.

PRESTON.—July 20th.—For [illegible] Borough Surveyor.

LANCASHIRE.—July 20th.—For the supply of [illegible] Mr. W. H. S[illegible] Preston.

EALING.—July 21st.—For making up [illegible] Grange-road, Sidney-road (portion), Willesden-road, Wordsworth-avenue, Wagenseil-avenue (portion), and Meadvale-road (portion), for the corporation. Mr. W. G. Hicks, borough engineer.

ACTON.—July 21st.—For making up [illegible] for the urban district council.—The Surveyor.

BARNOLDSWICK.—July 21st.—For patching, paving, and kerbing, for the urban district council.—Mr. W. Ellis, engineer and surveyor.

LANCHESTER.—July 22nd.—For making up certain streets, for the rural district council.—Mr. W. Cumming, highway surveyor.

LEIGH.—July 22nd.—For the supply of 1,700 tons of granite setts, for the corporation.—Mr. T. Hunter, borough engineer.

COLCHESTER.—July 29th.—For the laying of [illegible] yds. of wood block paving, for the corporation. Mr. H. Collins, borough engineer.

LLANTRISANT.—July 29th.—For making up certain streets, for the rural district council.—Mr. T. Saunders, surveyor, School-street, Pontyclun, Glam.

PERTHSHIRE.—July 31st.—For the reconstruction [illegible] road through Glen Dochart, Glen Falloch and Strath Fillan, in the parish of Killin, for the Western District Committee.—Mr. W. L. Gibson, engineer and surveyor, Post Office Buildings, Dunblane, Perthshire.

Sanitary.

HARROW.—July 11th.—For works of sewerage, for the urban district council. Mr. J. P. Bennett, engineer and surveyor.

ECCLES.—July 11th.—For a 5 to 6 b.h.p. oil engine, and 5-in. centrifugal pump piping, for the sewage disposal [illegible] Mr. G. W. Willis, sewage works engineer and manager, Peel Green-road, Patricroft.

BARROWFORD.—July 11th.—For the construction of sewage disposal works, for the urban district council.—Mr. F. Sutcliffe, surveyor.

HENDON.—July 13th.—For the removal of house refuse, for the urban district council.—Mr. S. S. [illegible]

WARBLINGTON.—July 13th.—For draining a recreation ground, for the urban district council.—District Surveyor.

LEYBURN.—July 14th.—For laying sewers and constructing sewage disposal works, for the rural district council.—Mr. F. J. Rodwell, engineer, 37 and 38 Prudential Assurance Buildings, Park-row, Leeds.

WALTON-ON-THAMES.—July 14th.—For [illegible] for the [illegible] Mr. R. W. [illegible]

LANARK.—July 14th—September 2nd.—For the construction of sewage tanks, outfall sewer, and other works, for the Middle Ward.—Mr. W. L. Douglass, district engineer, District Offices, Hamilton.

FIFE.—July 14th—20th.—For the construction of sewers and manholes, for the Dunfermline District Committee.—Messrs. Warren & Stuart, 94 Hope-street, Glasgow.

GOSFORTH.—July 14th.—For work of scavenging, for the urban district council.—Inspector of Nuisances.

MARKET BOSWORTH.—July 15th.—For the construction of sewers and manholes, for the rural district council.—Mr. W. M. Sykes, surveyor, 152 Melbourne-road, Ibstock.

SEFTON.—July 15th.—For the construction of pipe [illegible] Mr. J. J. W[illegible] Liverpool.

SCARBOROUGH.—July 15th.—For a sewage purification installation, for the rural district council.—Mr. J. A. Iveson, surveyor.

SOUTH SHIELDS.—July 16th.—For the construction [illegible] the corporation. Mr. L. Rosevcare, borough engineer.

RAWTENSTALL.—July 16th.—For the construction of sewers and manholes, for the corporation. Mr. J. [illegible] engineer.

RAMSBOTTOM.—July 16th.—For the erection of sludge pump, motor, wiring, and gearing, for the urban district council.—Messrs. J. Diggle & Son, Hind Hill-street, Heywood, Lancashire.

ROMFORD.—July 18th.—For the construction of stoneware pipe sewers, and road work, for the rural district council.—Mr. W. J. Grant, surveyor, 16A South-street, Romford.

BRADFORD.—July 20th.—For the construction of a circular outfall sewer in tunnel, for the corporation.—Mr. J. Watson, Town Hall.

FAREHAM.—July 20th.—For the provision and laying of about 465 yds. of 12-in. sea outfall pipe, about 87 yds. of 3-in. pipe, concrete cradle blocks, concrete piling and driving, laying about 8,000 yds. of 12-in., 9-in., and smaller stoneware pipe sewers, about 900 yds. of 12-in., 7-in. and 6-in. cast-iron pipe sewers, construction of manholes, ventilation and flushing chambers, storage tank, and other works, for the rural district council.—Mr. W. Cobbett, engineer, West-street, Fareham, Hants.

HALTWHISTLE.—July 20th.—For the construction of sewage disposal works, for the rural district council.—Mr. J. E. Parker, engineer, Post Office Chambers, Newcastle-on-Tyne.

DENTON.—July 22nd.—For the construction of about 1,000 yds. of 12-in. stoneware pipe sewer, partly in tunnel, and other works connected therewith, for the urban district council.—The Surveyor, Town Hall, Denton.

CANNOCK.—July 29th.—For the supply, delivery and placing in litters of about 3,000 cub. yds. of coal-blast furnace slag, and 1,845 cub. yds. of granite slag, washed and screened to the required size at the sewage farm, for the urban district council.—Mr. Robert Blanchard, engineer and surveyor, Council Offices.

PORTHCAWL.—July 31st.—For the construction of certain lengths of stoneware and iron sewers of 9, 12, and 21 in. diameter, and concrete tube sewers of 30 in. in diameter, manholes, flushing tanks, and sea outfall, for the urban district council.—Messrs. J. Taylor & Sons, Caxton House, Westminster, S.W.

EARBY.—July 31st.—For sewage disposal works extension, for the urban district council. Mr. J. E. Aldersley, engineer and surveyor.

RUNCORN.—August 7th.—For the construction of sewers and sewage disposal works, for the rural district council. Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

RUNCORN.—August 7th.—For laying steel tube, cast-iron and earthenware pipe sewers, flushing tanks, storm overflows, manholes, ventilators, sedimentation tanks, percolating filter (including reinforced concrete construction on the Kahn system), engine and pump-house, pump well, and other appurtenant works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

FLEET.—August 13th.—For the construction of about 16 miles of stoneware and cast-iron sewers, brick, concrete, and cast-iron manholes, flushing tanks, ventilating shafts and columns, cast-iron rising mains, air mains, engines, compressors, ejectors, and other works incidental thereto, for the urban district council.—Mr. T. J. Moss-Flower, engineer, 28 Victoria-street, Westminster, S.W.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Miscellaneous.

DARLINGTON.—July 15th.—For the sale by the rural district council of a McLaren 8-h.p. compound traction engine, a 7-h.p. Aveling & Porter compound traction engine, convertible into road roller, and four 8-ton traction wagons.—Mr. John Robinson, highway surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted.

FULHAM.—For installing low-pressure hot-water heating apparatus at the Wellamstreet school, Fulham, for the London County Council:—

Cannon & Helford, Peckham	£880
Brightside Foundry and Engineering Company, Limited, Victoria-street	867
H. J. Cash & Co., Limited, Westminster	778
Palowkar & Sons, Queen-street	722
Stroode & Co., Limited, Osnaburg-street ..	685
J. & F. May, Lincoln's Inn-fields	663
G. & J. Bradley, Lever-street	664
W. G. Cannon & Sons, Limited, London-road ..	659
Yetton & Brockett, Limited, Munton-road, S.E. ..	645
R. H. & J. Pearson, Limited, Notting Hill Gate† ..	556

HAMMERSMITH.—For installing low-pressure hot-water heating apparatus at the Victoria school, Hammersmith, for the London County Council:—

Arding & Dyne, Southwark Bridge-road ..	£893
Wilson & Smith, Limited, Strand	899
F. Deane & Son, Limited, London Bridge ..	840
Brightside Foundry and Engineering Company, Limited, Victoria-street	831
Palowkar & Sons, Queen-street	830
W. J. Burroughes & Sons, Holborn	825
Cannon & Helford, Stamford-road, Peckham ..	822
H. J. Cash & Co., Limited, Westminster	784
Yetton & Brockett, Limited, Munton-road, S.E. ..	750
W. G. Cannon & Sons, Limited, London-road, Southwark	758
J. & F. May, Lincoln's Inn-fields†	753

KILBURN.—For carpeting the path round the pond at Kilburn Grange, for the London County Council:—

J. Smart & Son, Victoria-street, S.W.	£80
Goddard & Co., Caledonian-road, N.	77
Constable, Hart & Co., Limited, Eastcheap, E.C.	70
Chittenden & Simmons, Limited, Victoria-street, S.W. ..	70
A. C. W. Hobman & Co., Limited, Bermondsey, S.E.† ..	67

Estimate of the chief officer of the Parks Department, £75.

MAIDSTONE.—For the reconstruction on the Hennebique system of Bow bridge, Wateringbury, for the rural district council.—Mr. R. H. Halls, engineer, Lewes:—

Jackaman & Son, Slough, Bucks	£3,975
Holloway Brothers, London	3,950
Pfayfair & Toole, Southampton	3,825
W. T. Nicholls, Gloucester	3,694
Wallis & Son, Maidstone	3,694
May & Co., Norwich	3,680
British Construction Company, London, S.W. ..	3,677
J. Garett & Son, London, S.W.	3,500
Cowlin & Son, Bristol	3,443
Yorkshire Hennebique Company, Leeds‡	3,397

MIDDLESEX.—For the erection of a tuberculosis dispensary at Ealing, for the county council.—Mr. H. G. Crothall, architect, Guildhall, Westminster:—

— Lacey	£2,242
Knight & Son	2,151
Dorey & Co.	2,100
Bollom	2,074
— Monk	2,060
Fassnidge & Son	1,975
W. J. Dickens, Ealing‡	1,889

NORTH DUBLIN.—For sewerage and water extension at Howth, for the rural district council.—Mr. P. H. McCarthy, engineer, Dublin:—

J. Fitzpatrick	£4,870
Martin & Co.	4,297
D. Clarke‡	3,972
J. Graham	3,925

Engineer's estimate, £4,777.

TEWKESBURY.—For the erection of workmen's dwellings, for the corporation.—Mr. Ridler, surveyor:—

A. Wilson, Cheltenham, £2,970.†

WINCHCOMB.—For the erection of twelve cottages, for the rural district council.—Mr. Thomas Malvern, architect, Cheltenham:—

— Turner	£2,652
— Drew	2,568
Cliff & Co.	2,500
— Burrows	2,245
Steward & Co.	2,224
Davies	2,030
— Williams	1,920
C. Fisher, Winchcomb‡	1,908

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JULY.

15-20.—Royal Institute of Public Health: Annual Congress at Edinburgh.

16-17.—Tramway and Light Railways Association: Annual Meeting at Newcastle-on-Tyne.

18.—Junior Institution of Engineers: Visit to Tunnel Portland Cement Works, Purfleet.

18.—Somerset Surveyors' Association: Meeting at Williton, 2 p.m.

25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

SEPTEMBER.

19. Institution of Municipal and County Engineers: Meeting at Cleethorpes.

26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

MADRAS CORPORATION, INDIA.
WANTED, ASSISTANT DRAINAGE ENGINEER.

The President, Corporation of Madras, invites applications for the appointment of Drainage Assistant to the Special Engineer, J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c.

The duties will be to assist the Special Engineer in the design, construction and maintenance of works of drainage for the City of Madras.

The salary will be Rs.300 (£33 6s. 8d.) per mensem, rising by annual increments of Rs.20 per mensem. An allowance of Rs.50 (£5) per mensem will be paid to the officer appointed so long as he maintains and uses on the work a bicycle motor cycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras the successful candidate will be required to sign a three years' agreement to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Officer appointed will be allowed ordinary first-class railway fares and second-class steamship passage to Madras, *viâ* Marseilles and Bombay, by P. and O. steamer. A bicycle return free passage will be granted on the termination of the appointment, subject to the satisfactory service according to the conditions of the agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but for not more than three months at a time.

The applicant must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India, must be enclosed with the application, which must reach the undersigned not later than Thursday, 30th July. They will be sent out to Madras, where the final selection will be made by the President of the Corporation.

The President reserves the right of rejecting all applications without giving reasons.

The Officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of the application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Drainage Assistant."

JAMES MANSERGH & SONS,
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster, London, S.W.
July 7, 1914. (1,770)

BOROUGH SURVEYOR in the North of England is willing to take a Pupil in his Office. Excellent experience on important works about to be carried out. Moderate premium; 3 years' articles. Apply Box 1,441, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,776)

BOROUGH OF DORCHESTER.
Wanted, experienced General Foreman. Cyclist. Age 35-45. Only those having had experience in works of a local authority need apply. Canvassing will disqualify. Applications, in own handwriting, upon the prescribed Form, with copies of three recent testimonials, endorsed "Foreman," to be sent by the 25th July, 1914, to A. G. Symonds, Town Clerk, Dorchester. (1,767)

BOROUGH OF CHEPPING WYCOMBE.

The Town Council invite applications for the appointment of Clerk in the Borough Surveyor's Department.

Candidates must be shorthand writers and typists and have a good knowledge of accounts as kept in a Municipal Surveyor's Office. Salary £78 per annum.

Applications, stating age and qualifications, with not more than three recent testimonials, endorsed "Surveyor's Clerk," must be delivered to the undersigned not later than noon on Wednesday, the 22nd July, 1914.

Canvassing will be considered a disqualification.

T. J. RUSHBROOKE,
Borough Engineer and Surveyor.

2, Lacy-street,
High Wycombe.
July 6, 1914. (1,770)

COUNTY OF CORNWALL.
APPOINTMENT OF COUNTY SURVEYOR.

The Cornwall County Council invite applications for the appointment of County Surveyor.

Applicants must be not less than 30 or more than 40 years of age.

The Council attach importance to applicants with experience in County Administration.

Salary £600 a year, increasing by £25 a year to £700.

Office and staff will be provided, and all necessary travelling expenses and other disbursements will be borne by the County Council.

The appointment will be during the pleasure of the Council, and be determinable by 3 months' notice on either side.

Applications must be accompanied by a summary of particulars as to previous service, &c., to be inserted in a Form which can be obtained from the undersigned, and be copies of not more than three recent testimonials.

Canvassing either directly or indirectly will be considered a disqualification, but candidates may send printed copies of their applications and testimonials to the members of the Highways Committee, a list of whose names can be obtained on application.

The person appointed will be required to devote the whole of his time to the duties of his office.

Applications must be sent in to the undersigned not later than the 31st instant.

Further particulars of the terms of the appointment may be obtained from the undersigned.

CHRISTOPHER L. COWLARD,
Clerk of the County Council.

Bodmin.
July 6, 1914. (1,765)

GREAT BERKHAMSTED URBAN DISTRICT COUNCIL.

The Council are prepared to receive applications from duly qualified persons for the appointment of a Sanitary Inspector and Surveyor, at a commencing salary of £250 (with office provided).

The person appointed will be required to reside in Berkhamsted, to devote his whole time to the duties of his office, and must not be more than 40 years of age.

Candidates must hold the certificate of competency in sanitary knowledge granted by the Sanitary Inspectors' Examination Board, or, prior to the 31st December, 1893, by the Sanitary Institute, and must possess practical experience of septic tanks and bacteria beds.

The appointment is subject to the approval of the Local Government Board, and is according with the Sanitary Officers' (Outside London) Order, 1910, and will be subject to the resolutions and orders of the Council relating to Officers.

There will be no compensation or superannuation on retirement or loss of office.

Applications, accompanied by not more than three testimonials, must be made in candidate's own handwriting on Forms to be obtained at my Office, and delivered here not later than Friday, the 24th July, 1914.

Canvassing is prohibited.

(By order)
THOS. PENNY,
Clerk.

147 High-street,
Great Berkhamsted, Herts. (1,763)

COUNTY BOROUGH OF SWANSEA.
APPOINTMENT OF BOROUGH ESTATE AGENT AND VALUER.

The Corporation of Swansea invite applications for the appointment of Borough Estate Agent and Valuer.

Salary £400 per annum, payable monthly.

Applicants stating age, qualifications, and experience, accompanied by copies of not more than three recent testimonials (which will not be returned), endorsed "Estate Agent," to be sent to me the undersigned (from whom particulars of the duties of the office can be obtained) not later than 12 o'clock noon on Tuesday, the 21st July, 1914.

Canvassing, either directly or indirectly, will be a disqualification.

H. LANG COATH,
Town Clerk.

Guildhall,
Swansea.
July 7, 1914. (1,771)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH OF LEIGH.
TENDERS FOR GRANITE SETTS.

The Corporation of Leigh are prepared to receive Tenders for the Supply of 1,700 tons of Granite Setts.

Forms of Tender and all requisite information may be obtained from Mr. Tom Hunter, Borough Engineer, Town Hall, Leigh, Lancashire.

Sealed Tenders, on official Forms, are to be delivered to the undersigned not later than noon on the 22nd July.

W. H. COWBURN,
Town Clerk.

Town Hall,
Leigh, Lancashire.
July 6, 1914. (1,758)

URBAN DISTRICT COUNCIL OF FLEET, HANTS.
FLEET SEWERAGE AND SEWAGE DISPOSAL WORKS.

The Urban District Council of Fleet invite Tenders from responsible and experienced Contractors for the Construction of these works, which comprise about 16 miles of Stoneware and Cast-iron Sewers, Brick, Concrete, and Cast-iron Manholes, Flushing Tanks, Ventilating Shafts and Columns, Cast-iron Rising Mains, Air Mains, Engines, Compressors, Ejectors, Ejector Stations, Engine-houses, Balancing, Detritus, Sedimentation, Upward Flow, Storm and other Tanks, Percolating Filters, Humus Channels, Laying Out Storm-water Area, Roads, Paths, and other incidental works.

The Plans may be seen, and a copy of the Specification, Quantities, and Form of Tender obtained, on and after the 20th July, 1914, at the Offices of the Council's Consulting Engineer, Mr. T. J. Moss-Flower, C.E., by appointment at 28 Victoria-street Westminster, S.W., and at any time at Carlton Chambers, Bristol, on deposit of a £10 Bank of England note, which will be refunded provided a *bonâ-fide* Tender be received and is not withdrawn before the sealing by the Council of one of the Tenders, and provided also that all the documents supplied be returned to the Engineer.

On production of a receipt for the Deposit a copy of the Plans may be inspected at the Council Offices, Fleet, on such days and at such times as will be communicated to firms tendering.

Sealed Tenders, endorsed "Tender for Fleet Sewerage and Sewage Disposal Works," are to be delivered at my Office at Fleet not later than 3 o'clock in the afternoon of Thursday, the 13th August, 1914.

The lowest or any Tender will not necessarily be accepted.

(By order)
W. H. WRIGHT,
Clerk to the Council.

Council Offices,
Fleet, Hants. (1,777)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. JULY 17, 1914. No. 1,174.

Minutes of Proceedings

The Life of Steel Pipes.

That a steel pipe should remain sound for an indefinite time is really not much more remarkable than that a lead pipe should, under certain conditions, be practically everlasting. W[illegible] Romans, but if these pipes had been subjected [illegible] depended not so much upon the excellence of the [illegible] quality of the water they contained and upon the quality of the material in which they were bedded. Similarly it ought to be possible to ensure that steel pipes are not brought into contact with [illegible] electrolytic action. It is shown by the chemist that waters can be so treated as to make them suitable for distribution in steel mains. We have instances of steel mains which have lasted longer than cast-iron pipes, and others where corrosion has ceased after treatment of the water. The prejudice against steel pipes, where it exists, is due to experience based upon the corrosion of steel when brought into contact with water of a certain quality. Seeing that waters vary in quality, and that the corrosive properties can be removed, it is very short-sighted policy to shut one's eyes to the advantages of the steel main.

The New York *Engineering Record* contains particulars of a steel pipe which has been found to be in good condition after seventeen years of service at New Bedford, Massachusetts. In the annual report of the superintendent of the water board the results of an inspection made recently are given. The main is 48 in. in diameter and 1,200 ft. long. Previous to its installation the comparative merits of steel and cast-iron pipe were the subject of much discussion by the water board, who were ultimately advised by their engineers to use steel pipe because the cost would be 28 per cent less than that of the cast-iron pipe. The life of the main was then estimated to be twenty-five years, but those who have just examined it find it in excellent condition, and state that it is now easy to prophesy its useful life for many years exceeding the twenty-five-year limit. It is shown that the tubercules which existed in the steel main five years ago, and which ranged from three to seventy per square foot, have only increased since from [illegible] beneath the tubercules have not grown materially deeper, neither have the tubercules increased very greatly in size. In the cast-iron mains in the same district the tubercules have, on the other hand, increased considerably in size. The average depth [illegible] as 0·110 in., which is no deeper than one found five years ago. [illegible] Thus the extreme pitting scarcely exceeds one-third of the thickness of the steel in a pipe which has been in service for seventeen years.

It should be noted that the pipe is coated, and that the coating has blistered. These blisters [illegible] of rust found upon the steel beneath them, and the water held in the blisters is found to be of an alkaline nature. The condition of this main is, of course, by no means perfect. It does not show such a result as might be hoped for where the water has been treated specially in order to prevent corrosion, but it affords excellent evidence of the life of a coated steel main put in under ordinary conditions, and may tend to confirm the judgment of those who have decided to rely upon steel pipes.

* * *

The Road Board's Fourth Annual Report.

The Road Board's policy as regards the allotment of the Road Improvement Fund and the nature of the works for which grants and loans are made is steadily developing, and the fourth annual report shows [illegible] accomplished in the past financial year, and that important developments are taking place with the steady growth of the revenue allotted to road improvement. The report shows very clearly that the present administrative system in Ireland, involving an awkward and stupifying dual responsibility, is extremely unsatisfactory, and it is definitely recommended that the system shall be [illegible] A bright ray of light has been thrown upon Irish administrative methods by the discovery that only about a quarter of the licence duties on motor

vehicles are collected in Ireland, and the board is naturally reluctant to make up the deficiency from the pockets of English and Scottish taxpayers. In Scotland the only serious difficulty with respect to applications for grants is one which is rather financial than administrative in character, and the board, quite justifiably, has in a number of cases contributed unusually large proportions of the cost of improvements on roads in Scotland.

With respect to the proportion of the funds which is to be allotted to Greater London, we believe that unbiassed opinion will strongly support the board's decision that the share of that area should not be more than that arrived at on a population basis. We are not so confident that the policy of the board is satisfactory as to grants to district roads. There is nothing unsound in the presentment of the case as regards finance, and the relief afforded to ratepayers. But that is not the whole story, and from the engineering point of view we should have welcomed an announcement to the effect that the board were making a beginning, in some favourable area, with the work of improving the road system from the other end. As regards the larger schemes for road improvement, on the other hand, we are very glad to learn that these now form so important a feature of the work of road improvement. We long ago pointed out that it was desirable to concentrate work, and to deal with considerable mileages at once with suitable staffs, and the schemes now announced are the more to be welcomed in that the relatively high average cost per mile shows that they are works of comprehensive improvement.

As to the widths of important main roads, the faddists will find a serious check to their ambitions in the announcement that the board do not encourage the widening of the metalled portion of the carriageways through rural areas beyond 18 ft., "as they are of opinion that this width is generally adequate for traffic purposes, except in the immediate vicinity of towns." Since the board favours "as much land as possible being secured between fences," their policy does not stand in the way of future widenings of carriageways, if necessary, and the country as a whole is greatly indebted to Sir George Gibb, to whom must be accorded the credit for having succeeded, in the face of considerable difficulties we believe, in giving effect to sound opinion in this matter. A summary of the main features of the report, with important passages quoted in full, will appear in next week's issue.

The Repair of Railway Bridges.

In our issue of March 27th last we commented upon the case of *Attorney-General* v. *Sharpness New Docks, &c., Company*, in which it was decided by the Court of Appeal that a canal company, whose special Act bound them to keep the bridges over their canal in "sufficient repair," must maintain them according to an "up to date" standard, sufficient to carry the traffic of the day. We pointed out that it was an interesting question whether the same principle would be applied to bridges carrying highways over railways. The liability of the canal company in this case was imposed by their special Act, which provided that they should maintain the bridges "in sufficient repair." The liability of railway companies is imposed by sec. 46 of the Railway Clauses Act, 1845, which binds a railway company simply to "maintain" the bridges (without the addition of the words "in sufficient repair"). But we suggested that it would be too nice a distinction to attempt to discriminate between the several liabilities entailed by these two different phrases. This view of the matter is confirmed by the recent case of *Attorney-General* v. *Great Northern Railway Company* (noted at page 1059, *ante*), in which Mr. Justice Warrington held that the obligation of the railway company with respect to a bridge carrying the highway over their line at Crouch End was to maintain the bridge in such a condition of safety that it would be sufficient for the passage of the traffic which might be expected upon it.

The main principles underlying both decisions, as set out in Mr. Justice Warrington's judgment, may be thus summarised: (1) Those who interrupt a highway, under statutory powers, for their own purposes, must construct and maintain the necessary works to restore the use of the highway to the public, unless the statute under which they are acting exempts them from such obligation; and (2) the standard of repair of such works (in this case a bridge) is to be measured by the obligation which rests upon the highway authority with respect to the highway of which the bridge forms part, or in other words it is to be determined by the nature and extent of the traffic upon and to be expected upon the highway of which the bridge forms part. Another important point decided by this case has reference to the effect of the Local Government Board regulations as to heavy motor traffic on bridges. These regulations, as our readers are aware, prohibit the use of heavy motor-cars on a bridge when the party liable for its repair affixes a notice that the bridge is insufficient for such traffic. The railway company had affixed such a notice in this case, and contended that this exempted them from liability to render the bridge safe for heavy motor vehicles. Mr. Justice Warrington, however, held that the true effect of the regulations was merely to enable the company to exclude heavy traffic while the bridge remained insufficient, and not to qualify their obligation to render it sufficient if and when heavy traffic might be expected on the highway.

* * *

Croydon's Relief Road: The Present Position.

In another part of this issue there will be found a sketch of the present position as regards the project for the provision of a relief road to take through traffic past Croydon. Some of the engineering features of the scheme were described in our issue of November 28, 1913, and attention may also be directed to an article on "By-pass Roads," by Mr. Reginald Eaves, M.Cons.E., in our issue of May 30, 1913, in which the subject is treated generally, but in a manner strongly suggestive of a solution of the present difficulty as regards Croydon. A difficulty there certainly is, since it can hardly be supposed that the view taken by the Local Government Board will be altered by the fact that the Road Board has promised an additional grant to cover the cost of a desirable work not included in the original estimate. The suggested solution is to reduce the whole cost of the scheme, as regards both construction and maintenance, by reducing it to a road scheme, doing away with all features connected with the development of the route as a main shopping thoroughfare. We can see no reason why a relief road should not pass between back gardens, or between the gardens of houses fronting side roads at right angles to the relief road. Such a road, with ample provision for the widening of the carriageway itself, could be made once for all of the full total width necessary, or likely to be necessary, and if in the future the traffic were to increase so much that widening became imperative, all concerned would indeed be thankful that the road was lined by gardens instead of by costly business premises.

Surely it is a mistake to reproduce on the new

road: those very features which are responsible for the present congestion. The underlying idea in providing a relief road is to separate those who want to drive through or past Croydon from those who want to drive about in Croydon and leave their vehicles standing by the kerb. From this point of view, some of the strongest local advocates of the scheme are really giving their support to it on terms which will be far from satisfactory to the through traffic interests in the future. On the other hand, some of the opponents of the scheme might become supporters of a project for a by-pass road which could never become a shopping street. If Croydon needs developments of this kind to the west of the High-street, such developments could take place independently of the relief road. Several streets which lie in that area could be named as far more promising than the route of the proposed relief road, and their usefulness in this sense would be all the greater from the linking up provided by a road intended for traffic and not for local business. We commend these considerations, and the arguments set forth in Mr. Ryves' article, to the attention not only of those interested in the Croydon project, but also of all who are concerned with town planning or the provision of by-pass roads.

* * *

The Dog as an Urban Resident. In a pithy paragraph under the heading "Things One Would Like to Know" in a recent issue our contributor brings forward a subject to which reference was made in these pages some years ago, and one which has now become of greater importance. He asks why it is that people will keep dogs in towns, and whether it would not have been a good plan to impose a tax of 10 guineas a year on people who own dogs in any town of more than 20,000 inhabitants. Now some of these animals are kept by lonely persons who value them as companions, being too poor, or too stupid, to take the responsibility of adopting children instead; and some are kept as watch-dogs. But most of them are owned by persons who value them merely as additions to the interest of life, and because they like some of their possessions to be alive, and capable of producing incidents spontaneously.

The presence of these animals in large numbers is, however, a source of much inconvenience to the public, and possibly of some unconsidered and obscure dangers to health. In many residential areas the dogs' contributions to night noises are frequent and violent. But a more serious nuisance, to many minds, and one which is felt by all refined persons, is the filthiness of footways and of shop and house fronts, resulting from the presence of a large number of dogs in an urban or suburban area. In suggesting that a special tax should be imposed on town dogs our contributor revives an idea put forward by Mr. Reginald Brown in a paper read before the Royal Sanitary Institute in 1908. Mr. Brown then suggested that owners of dogs should pay an increased licence to cover the cost of special scavenging. At that time the nuisance was not so serious as it is now, and while we did not oppose Mr. Brown's view, we did not definitely support it. Moreover, his case was weakened, and indeed almost destroyed, by his including in his indictment the cat, which led us to observe, in our issue of August 14, 1908, that this animal is one "which for cleanliness in the matter of sewage disposal is an object-lesson to the world." We supported Mr. Brown's views in the matter of the prevention of the practice of depositing sweepings on public thoroughfares, and that of spitting, and, since all these things hang together, we are now disposed to support the enforcing of suitable means of checking the nuisance of filth caused by dogs—if any such measures can be practically framed.

* * *

The Sanitary Institute at Blackpool. Last week we made some reference to the conference of engineers and surveyors which was held in connection with the recent congress of the Royal Sanitary Institute at Blackpool, and we were then able to give a full report of the address delivered by Mr. J. S. Brodie, who presided. Following upon this address the conference discussed three interesting papers, some account of which will be found in another column. The first of these was read by Mr. T. G. Lumb, ASSOC.M.INST.C.E., and dealt with "Town Planning and Garden Cities." The discussion showed that the meeting generally agreed with the main principles laid down by Mr. Lumb, the only point of criticism arising on a statement in the paper that "up to the present little or nothing has been done by local authorities in the matter of town planning, even with all the advantages gained by the adoption of the Act." In regard to this matter we are bound to say that we agree with Mr. Willis, who, in moving a vote of thanks to the author of the paper, expressed the opinion that, considering the difficulties which have had to be overcome, very great progress has been made. The second paper on "The Sanitary Side of Town Planning" was submitted by Mr. A. J. Price, ASSOC.M.INST.C.E., of Eccles, and we cordially agree with the chairman in congratulating the conference on having a young member to bring forward a paper of such excellence. The paper may perhaps best be described as a plea for sanitary foresight, so that new districts may have the benefit of the most up-to-date methods, which are in many cases impossible in built up areas on the ground of expense. For example, Mr. Price advocated pipe subways, the collection of house refuse by a pneumatic system, and the provision of ample open spaces. The last paper was presented by Mr. J. W. Hipwood, the borough engineer and surveyor of Morecambe, who took as his subject "Seaside Amenities." The importance of the maintenance of the full amenities of a seaside resort is obvious, and Mr. Hipwood duly laid emphasis on the more important points to be observed.

* *

Sewage Managers at Norwich. The annual general summer meeting of the Association of Managers of Sewage Disposal Works is an event which must not be allowed to pass without some notice. The association is one which may not be very much in the public eye, but it is doing very useful work in connection with one of the most important of the municipal services affecting the public health. The meeting this year took place at Norwich, where the members were officially welcomed by the Lord Mayor, who, in opening the proceedings, referred to the possibility which the future held of converting sewage into manure on commercial lines. In reply, Dr. Bostock Hill, the president of the association, pointed out that the whole science of bacteriology is of very recent growth, and that as greater knowledge of the habits and functions of the various micro-organisms is attained, more will, no doubt, be possible in the direction indicated. The meeting was privileged to hear a description by Mr. A. E. Collins of the system of sewage treatment adopted by the Norwich Corporation, and subsequently a visit was paid to the works. A keen interest was evinced by those present in the whole of the proceedings, and those responsible for the organisation are to be congratulated on a thoroughly successful meeting.

Grouting and Penetrating Methods of Road Surfaces.*

[illegible]

[illegible] the somewhat thankless duty of making roads for the [illegible]

It would not be out of place, and it might be helpful [illegible] which the road maker is bound to consider, and which [illegible] not thoroughly appreciate. . . .

[illegible] the gradients are exceptionally steep, with sufficient foothold for horses, and in frosty and muddy weather when the surfaces are greasy, an adequate supply of grit must be at hand. At the same time, these surfaces should be kept waterproof and as free from mud and dust as possible on account of the ever-increasing motor traffic. If motor traffic was all of one kind, a well tarred, sprayed, macadam would meet the case in many areas and for many miles of roads; but this traffic again is divided into various classes—*e.g.*, heavy motors, light motors, vehicles driven by steam with broad rough tyres and heavy [illegible]

These various kinds of traffic require special and [illegible] factory condition.

This paper does not deal with main roads or county roads, but more particularly with secondary roads in towns and suburbs, which, at the same time, have considerable traffic, and occasionally are liable to have to carry all sorts and conditions of vehicles and tractors.

From a maintenance point of view it has been found that one of the most difficult roads to keep in good condition is the level road, which, on account of its want of proper longitudinal fall, particularly in wet weather, absorbs a large amount of moisture. Even a waterproofed road is more or less liable, partly owing to its position, to retain moisture in its foundations or in the subsoil if the district around is of a low-lying insufficiently drained character.

A [illegible] cleansing with every shower of rain, and has a chance of a much longer life, in addition to being more easily kept clean and in a satisfactory condition. The margins of roads where tram lines are in the centre will not be dealt with. These have caused enough anxiety, and will continue to do so, to their surveyors as long as tram lines exist, and must always require more or less special treatment. Another reason for calling particular attention to the grouting and penetrating methods is the great difficulty, which it is believed is not uncommon, experienced in obtaining the necessary supplies of tarred road materials of various kinds in the quantity and at the times when they are most urgently needed.

One frequently has the misfortune to have a long and important road undergoing reconstruction, and to be hampered and harassed with the difficulty of obtaining a sufficient quantity of these materials to continue and complete the work in anything like a reasonable time.

All these difficulties make it desirable and necessary for road makers to have more than one string to their [illegible]

[illegible] AND METHODS

when emergencies of this nature occur, in order to [illegible]

* Paper read at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham

able time with as little inconvenience to the public as possible.

Two points that road engineers have to deal with must be emphasised: Road surfaces must not only be able to stand the suction which is the result of rapid motor traffic, with indiarubber tyres, which removes the dust, grit, sand, mud and water out of the water-bound roads, and sooner or later the small and then the larger stones themselves as they become loosened by disintegration, but consideration must be given to the provision of surfaces which will withstand the vibration from heavy vehicles—horse drawn, steam driven, and otherwise—which, with the continual hammering of the horses' hoofs and the solid iron tyres, often shake the crust of the road and also its foundations.

[illegible] long under all these conditions. If the traffic were uniform, the problem would be simpler, and less expensive methods might be more easily adopted. All these points have to be considered in the construction or reconstruction of any road, and, as a rule, a road [illegible] will be able to withstand all these conditions in a thoroughly satisfactory manner.

So far, difficulties common to all road engineers have been dealt with, among which that of an adequate supply of materials is by no means the least at the present time.

It no doubt arises largely from the fact that tarred materials of one sort or another have been recognised as one of the chief and best methods of road making, and road authorities—county, urban and rural—are all, without exception, making great efforts to meet the road problem of the day, and partly also on account of the fact that tarred materials can best be laid in dry weather, as most of these new surfaces and reconstruction of roads are done in the few months in the summer which can be relied upon as most suitable for this purpose.

If anyone can discover a material which can be used as satisfactorily in wet weather as in fine, or in winter as easily as in summer, no difficulty would be found in obtaining a ready sale for it.

It seems almost superfluous to reiterate here the [illegible] ADVANTAGE OF TAR-SPRAYING

on well-constructed macadam roads. Most engineers have found that this is of immense advantage not only in the prevention of dust and mud in main roads subject to heavy and rapid traffic, but also that it adds considerably to the life of those roads, and is a distinct advantage from a health point of view in second-rate residential roads made of macadam in which many of the poor in our towns have to live. These streets often swarm with children who use them as their chief playgrounds. The sanitary advantage of tar-spraying in these roads can hardly be overestimated.

Leaving the difficulties of the situation generally, [illegible] proper foundations and good drainage to all roads which are to be treated with waterproof surfaces and have to bear heavy traffic. Many roads which have for years been subject to heavy traffic have been found to consist almost entirely of a number of coats of macadam laid one upon the top of the other, the whole mass resting on a clay underbed without foundation or drainage of any kind. It is impossible for roads constructed on such lines to last, and in such cases the old macadam has invariably had to be removed, and below that, to the required depth, the surplus soil excavated and removed, and in its place a foundation of 6-in. or 8-in. slag pitchers laid upon a properly formed and well-rolled bed consisting of several inches of rough, hard clinker. The advantage of this layer of clinker is to prevent the clay or underbed working through the pitchers towards the surface, and consequently causing the foundation to give way and become uneven. This usually forms an excellent drainage, and remains of lasting benefit to the newly constructed road. Upon this foundation several types of grouting or penetrating methods have been tried, the first which naturally suggested itself being that of ordinary tar. The first trial of this kind was made some five or six years ago on a road which had a natural and suffi-

[illegible] grit to spread upon the top. This road surface, which is subject to a fair amount of traffic of various kinds, [illegible] repairs.

This class of road, provided it is constructed in dry [illegible] very little more costly than ordinary water-bound [illegible] follow the commencement of the work, completion [illegible] surface, in others there have been less satisfactory [illegible] case was laid in two coats; the first coat was treated similarly to the one made of slag referred to above, and after it had been thoroughly grouted and rolled in, a second coat, one stone thick, of basalt was laid upon the top, and the process repeated with Plascom and chippings until the final surface was finished.

[illegible] its life cannot be estimated. The carriageway is narrow, the surface is a level one, with hardly any gradient, and the traffic of a heavy nature, mostly with iron tyres, such as railway drays and vehicles of that kind. The surface to-day is almost as good as when it was laid down, but time alone can say how long it will last. Ordinary water-bound macadam in this road only lasts a year.

Roads grouted with Rocmac and with Glutrin have also been laid in an experimental manner, also with various results, but the latter experiments, made about twelve months ago, when the materials in both cases were mixed on boards in the form of concrete, have been much more satisfactory, and promise to make a more lasting surface, and one which affords at the same time a most excellent foothold for horses. The great advantage of these two materials is that they may be laid in wet weather even better than in fine weather, and consequently the work is not interrupted for any outside causes, as is the case with tar roads sometimes.

Plascom, Rocmac and Glutrin are more costly than Tarmac in the first instance, but the length of life has so far not been sufficient for a proper comparison.

Beyond the fact that Rocmac and Glutrin grouted [illegible] much better foothold for horses. A coat of tar dressing in the summer will prevent them being dusty, and add to the length of life generally.

A road was formed and treated with Bituvia on similar lines to Plascom and tar grout, and this, although only a year old, is also in good condition, and promises a fair life in the future.

There may be other forms of grouted roads equally good and useful, but there is still room for further progress in this direction, and the inventor, if the method be not an expensive one, might easily make a fortune. Most engineers would be glad to have a longer period, extending through the winter, in which to continue their road work, especially as sometimes it is difficult to find sufficient employment for all their good and useful men during the winter months when [illegible]

Essex Main Roads Reconstruction.—At a meeting of the Essex County Council at Chelmsford last week a general scheme of main road reconstruction, to be carried out in five years, was adopted.

PUBLIC SWIMMING BATHS WATER.

CONTINUOUS AERATION AND FILTRATION.

Mr. R. A. Blakeborough (Brighouse) being prevented from attending the recent meeting of the Institution of Water Engineers at Stockport at which Mr. L. Holme Lewis (Manchester) read a [illegible] of the Water of Public Swimming Baths," submitted the following observations in writing:—

"While the author's paper is an interesting account of the early development of this system, his remarks refer entirely to the one process of which he has evidently had considerable experience. Within recent years, however, considerable advancements have been made in the purification of bath water, with corresponding improved results, of which [illegible] tion of any members who may be interested in this subject I desire to briefly call attention to these developments. The principal addition to the process [illegible] applied by Mr. B. Bramwell, M.I.MECH.E., in the patent 'Turnover' filter. The system was first [illegible] by Mr. Bramwell on the subject before the Royal Sanitary Institute at their summer meeting in Belfast in 1911. Since then a number of baths have been equipped with the system, and the results have been satisfactory beyond all expectation. Although efficient aëration is considered a necessary part of the treatment, the chemical treatment is, in my opinion, an equally, if not a more, important factor, for by it not only is a much brighter and clearer water produced, but any colour in the water is much more quickly eliminated, and, what is of still greater importance, the bacteriological purity of the filtered water is unquestionable. The chemicals used are the same as are in use all over the world for the purification of drinking water for the supply of towns, and are absolutely harmless. The treatment has a powerful germicidal action, eliminating all traces of bacteria associated with sewage or fæcal pollution, as well as those associated with disease. Water taken from a swimming pond which had not been emptied or refilled during the six months from May to October of last year, and in which thousands of people bathed, was pronounced by F. W. Richardson, Esq., F.I.C., county analyst, Bradford, as being quite passable for drinking purposes. This water had been purified continuously during the whole period by the plant referred to above, without any overtime or night work being necessary."

Replying to Mr. Blakeborough's communication, Mr. Lewis wrote:

"I am unable to agree with his claim that chemical treatment is more important than aëration in the purification of the water of public baths. Aëration and filtration are indispensable parts of the scheme, but not so chemical treatment. While the experiments described in the paper were being carried out the use of chemical reagents to aid the process of purification received careful consideration, and, as indicated in the paper, it was concluded that it was undesirable to resort to chemical treatment provided satisfactory results could be otherwise obtained. That this is practicable is proved beyond doubt by the bacteriological and chemical analyses submitted with the paper. One might be led to suppose from Mr. Blakeborough's remarks that the use of aluminoferric or other reagents restricts the choice of filter to the 'Turnover' type. That, of course, is not the case. The use of aluminoferric for the purification of public bath water can also be applied in connection with Mr. Row's system, but my experience is decidedly opposed to chemical treatment. Not only does it involve the expenditure of more water for flushing the filters, and add to the cost of working, but it has the effect of coagulating the fatty matter given off by the human body which has a tendency to rise to the surface of the water in the bath, and is very disagreeable to the touch."

Town Planning Schemes.—It is understood that the [illegible] for the preparation of five further town planning schemes under the Housing, Town Planning, &c., Act, 1909. The schemes are authorised to be prepared by the Corporations of Huddersfield and Tynemouth, and the Urban District Council of Barnet. In the case of Huddersfield three schemes are authorised.

Royal Sanitary Institute Congress at Blackpool.

CONFERENCE OF ENGINEERS AND SURVEYORS.

[illegible] Mr. [illegible] read a paper on the subject of "Town Planning and Garden Cities" at the Royal Sanitary Institute Congress at Blackpool last [illegible] by Mr. [illegible]

TOWN PLANNING AND GARDEN CITIES.

Mr. [illegible] stated that up to the present little or nothing had been done by local authorities in the matter of town planning, even with all the advantages gained by the adoption of the Act. Near towns where traffic is likely to increase, ought to be designed on definite lines, especially in and around seaside resorts. In towns and cities where there were ground landlords, and if the laying out was in capable hands, there were possibilities of a most satisfactory scheme being evolved without the adoption of the Act, [illegible] where an area was under one control, very often the desire to extract the maximum profit ended in a failure and a [illegible] property. In the case of the individual owner he not unnaturally laid out his own land to obtain the maximum amount of profit, and to enable him to use every yard possible for building purposes, and often from the very selfish desire to shut out the neighbouring owner where possible from convenient access to the centre of the town, causing serious inconvenience and expense to the community. This had been done, unfortunately, in most towns, and if the authorities did not take immediate steps to alter this state of affairs the suburban developments would be ruined. Towns, with few exceptions, developed on commercial lines and in a piecemeal manner, and if local authorities concentrated their efforts on obtaining fine trunk roads they could safely leave the individual owner to lay out his own land. A reasonable proposition would be for the corporation to make the trunk roads of sufficient width, the landowner to give the land necessary for the construction of an ordinary statutory road. The corporation should not lodge a claim for betterment, nor the landowner any claim for compensation. Also surveyors of local authorities should not lose sight of the fact that it was very desirable to cordially co-operate with the landlords and their advisers.

Mr. E. Willis (Chiswick), in moving a vote of thanks to the author, said he did not quite agree with the sentence that very little had been done up to the present day in connection with town planning. Considering the difficulties which had to be overcome, he considered that a very great deal had been done. Throughout the country many local authorities had passed resolutions in regard to the matter, although he agreed that was only the commencement of the difficulty. The serious difficulty undoubtedly was to bring the various owners into line so that the whole scheme might be completed. He was a strong believer that town planning should be compulsory. He did not suggest that they should plan the whole of England with streets, but he did feel that the onus of guarding the amenities of their districts should be thrown on every local authority throughout the United Kingdom. When that was realised local authorities would not be slow to avail themselves of the opportunities offered to them. If some fiat from the Government could go forward that the main lines of streets should be set out, and districts covered by the provisions of a town planning scheme, then they would be able to prevent a large district being spoilt owing to the owner of a few acres allowing a factory for an offensive trade to be erected.

Mr. C. J. Jenkin (Finchley) said that, in connection with arterial roads, Mr. H. Samuel had outlined the possibility of town planning being compulsory for the whole of England. It would not mean that the actual setting out of towns should be put down on paper, but it would mean that the development of towns on wrong lines would be stopped, and if they could stop development on wrong lines the development would probably go on on better lines.

Mr. Gregson (Southport) remarked that town planning, after all, reduced itself in the end to a question of finance, and high land values were not [illegible] with town planning. If they reduced the number of [illegible] the value of the [illegible] and the [illegible] would be [illegible] in [illegible] that the [illegible] was more [illegible] and more artistically covered, and also to the fact that he was doing his duty in attending to the well-being of the community.

Mr. J. Munce (Belfast) thought that if those responsible for town planning tried to avoid the terrible [illegible] of their predecessors they would earn the gratitude of those who came after them. For the last fifty years the roads in Belfast had been laid on [illegible] to good planning, [illegible] the difficulty in all places was that the man with one field thought his was the best field in the country, and wanted to lay it out to suit himself.

Mr. Lumb, in reply, said he quite agreed that, to a certain limited extent, town planning should be compulsory. From the surveyor's point of view he thought the limited extent should be that they should get the arterial roads definitely fixed in the outlying districts before the small owner began to develop in his own way. Their experience was like that of Mr. Munce, that every owner thought his field was the best.

Mr. Alfred J. Price, Assoc.M.Inst.C.E., Eccles, next submitted a paper on

THE SANITARY SIDE OF TOWN PLANNING.

Town planning (said the author) was now generally admitted to be necessary, and a wise policy for even the smallest districts to prevent them from becoming slums in the future. Every town council should be compelled to prepare a town plan for their district, on which should be laid out the main arterial roads, the various areas reserved for civic, commercial, industrial and residential purposes, with the number of houses allowed on the different residential areas, widths of the main and secondary roads, and the sites to be reserved for parks, open spaces and recreation grounds.

The water supply and sewerage systems, with the positions of the waterworks and pipes for distribution, and the sewers, outfall and sewage disposal works, should have their main lines and positions settled with due regard to future requirements, and the safeguarding of the health of the inhabitants of the district. The method of sewering, whether separate, combined or partially separate systems, and the dealing with surface and storm water, should also be determined. The lines and contours of streets influenced the lines, sizes and gradients of the sewers, and *vice versâ*. If a comprehensive plan had been prepared of the whole district, some towns which now had to pump the sewage might have effected a considerable saving by adopting a gravitation scheme.

The general lay-out of a town called for careful judgment in locating the various portions for civic, commercial, industrial and residential purposes. All factories should be confined to one quarter, and situated so that the prevailing winds blow the smoke away from the residential and commercial areas. Factory workers desired to live near their work, and a number of cottages should be built near the factories, although with the introduction of cheap tram fares there was a growing tendency for workers to live somewhat further away from the factories, in areas where land and cottages were cheaper, and the atmosphere purer.

The present costly, tedious and insanitary methods of scavenging by the social wreckage of our large towns should be superseded by the motor-driven sweeping and watering machine with its automatic collecting tank.

The house-to-house collection of refuse, with its untidy and unsightly littering of streets, should be superseded by a more sanitary, convenient and efficient method—viz., a pneumatic system of collection, by which the refuse emptied into a hopper at each house would be drawn through pipes by vacuum pumps, or blown through by air compressors to a refuse destructor, where it would be fed, without handling, into the furnaces, thus providing part of the power required to work the pumps or compressors.

and saving a large amount of money spent on manual and team labour.

The nuisance caused by frequent opening of streets for repairing sewers, and gas, water and other pipes, should be avoided by the provision of subways to accommodate and underground pipes and cables.

Streets should be made wide enough for future requirements, be direct, and have easy gradients, and while main arterial roads should be made wider than at present, residential streets might be made narrower so long as the distance between the houses was not less than 50 ft. or 60 ft.

Variable construction of road making should be adopted for the different classes of streets instead of the one general by law method. Wide radial and ring roads gave convenient access from the outskirts to the centre, and acted as lungs. The streets should be planted with trees, as far as possible, so as to relieve the monotonous and depressing appearance of streets.

The provision of suitable and sanitary cottages at a reasonable rent was a pressing need in both urban and rural districts.

The provision of open spaces, around which should be built the chief civic buildings of the district, of public parks overlooked by hospitals or sanatoria, and of recreation grounds near the schools and in the industrial areas was essential for the health of the people, and should form one of the chief features of every town plan. Open-air and covered swimming baths, football and cricket grounds, tennis courts, bowling greens and gymnasia should also be provided.

The CHAIRMAN (Mr. J. S. Brodie) proposed a vote of thanks to the author, and congratulated the institute on having a young member coming forward with a paper of value.

Mr. E. G. MAWBEY (Leicester), who seconded the motion, said that some people considered there was great difficulty in commencing a scheme of town planning, but the first step was really very simple. The late Mr. Alderman Thompson, a few days before his death, pointed out that, unless local authorities were prepared to relax their by-laws to give facilities for town planning, they could not get on as they should. If they wanted wide roads they would have to give something to the landowner, and if they did contribute to the cost, they would get it back in the way of health in the district.

Mr. J. MUNCE (Belfast) said he believed that every local authority should be compelled to prepare a scheme of town planning, and there should be a penalty for those who did not do so. But when a scheme had been prepared there should be some way of altering it if experience showed the necessity of doing so. He did not agree with all the factories being put in one place; in Belfast it certainly would not do to put the linen factories alongside the foundries and the shipbuilding yards. He did not agree with the author on the question of subways; 95 per cent of the openings in new streets were not for pipes which could be laid in subways, but were for pipes connecting to houses, and they could not have a subway to every house. As to the height of buildings in Belfast, no building could be higher than the width of the street without the consent of the corporation.

Mr. E. WILLIS (Chiswick) considered that, where a road was essentially an arterial road, a great deal, or the whole, of the cost should be borne by the State. In all town planning schemes there should be a provision that the elevation of buildings should be submitted to the local authority for their approval.

Mr. A. RACE (Barrow) pointed out that, owing to the foresight shown in the development of that town, they had little need for town planning, and they had many of the powers which had been suggested, including jurisdiction over the elevation of the houses in many thoroughfares.

Mr. MEASHAM LEE (Karachi) remarked that in his district the local authority owned 72 out of 75 square miles; but even in such a case the problem of providing amenities was real and vital.

Mr. W. STUBBS (Blackburn) said there seemed to be a sort of general idea that the better-class dwellings should be put in one district, the working-class in another, and the mills in another. Coming from a cotton-manufacturing town he thought that was a mistake. Seeing how electricity was coming into general use as the motive power, he saw no reason why houses for the working classes should not be erected in close proximity to the mills.

Mr. PRICE, in reply, said he quite agreed that they could not expect the landowner to give a small number of houses to the acre unless they cheapened development by allowing cheaper roads. With regard to Mr. Munce's point as to alterations of a town planning scheme, he suggested that a scheme should remain in force for a certain number of years, and then come up for amendment if necessary. When he referred to subways he meant that they should be constructed in the main shopping thoroughfares, where there was a lot of traffic. In regard to the situation of factories, his view was those of a more offensive character should be placed together. On a recent visit to Rouen he saw they had planted the gasworks on an island, and it was so surrounded by trees that one had to go up a hill to see it.

The subject of the next paper presented by Mr. J. W. Hipwood, borough engineer and surveyor of Morecambe, was

SEASIDE AMENITIES.

Mr. Hipwood said that in a health resort the elimination, or at any rate the reduction to a minimum, of unnecessary noises was one of the first essentials to be aimed at. In the matter of road making much could be done in the selection or improvement of road surfaces, so that the minimum of noise was experienced. Among the primary requirements was that of spaciousness, which included the provision of wide open spaces, promenades or boulevards. A promenade was to a health resort what a shop window was to a business, and the town's success was often judged accordingly.

One frequently noticed what would otherwise be a pleasing vista disfigured by notice boards, time tables, placards, or other bill-posting stations of various description, and their grouping or transference to a more appropriate position could generally be arranged to the mutual advantage of all.

In the selection of seating for promenades a vast improvement in the effect could be obtained by the fixing of garden seating or furniture of good design, instead of those having the iron scroll arms at the end and the usual plank seating. It was very desirable also for all shelters to have accommodation suitable for use in wet or windy weather, whatever the direction of the wind.

As regarded bandstands, it was essential to provide sufficient shelter from the elements to ensure comfort and health for the performers. The most effective and simplest method known to the author was the provision of sliding screens, which were made in narrow sections and hung to run on an overhead track running round the outer edge of the ceiling and with a track guide round the floor of the bandstand. If the upper two-thirds of the screen was glazed there was very little interference with the view.

The planting of all streets wherever possible with street trees exercised a more favourable, though probably unconscious, influence upon the visitors than in any improvements of much greater magnitude and expense.

In Morecambe the trees which had proved most successful were wych elm, Cornish elm, lime, sycamore, and Lombardy poplar.

It was, of course, a *sine qua non* for a seaside resort to possess a sewerage system above suspicion, and no effort should be spared to prevent any complaint arising either from house drainage or sewers or sewage disposal works. The daily collection of house refuse in properly covered, low-bodied refuse carts was also of primary importance in a seaside town during the season.

In the matter of roads, tar-macadam or wood-block roads would lead in popularity for promenade and main street work as affording freedom from dust or noise, but tar-sprayed and well-drained granite roads followed quickly after as a cheaper and efficient substitute. For the purpose of rendering any roads dustless, where the cost of tar-spraying was too great, the author had used for some few seasons a patented compound which acted as a germicide, and could be applied with an ordinary water-cart. It consisted chiefly of rosin, caustic soda, creosote, and pitch. The roads were treated once a week with 5 per cent solution mixed with water, reduced to 2½ per cent after the first few applications, when the road surface would be found to have been strengthened by the treatment and to have a tar-sprayed appearance.

Among the more important items was the plentiful provision of public lavatories or underground con-

[illegible]

out any extra cost in the water bill.

[illegible]

side public property, it was well to mention the in-

[illegible]

effects could be obtained by their use for all coats except the first. Green, gold, ivory, cream, or white always pleased the eye, and if employed in simple colour schemes satisfactory results would ensue. Enamelled or varnished finishing coats proved a decided economy in the long run, and retained their freshness a much longer time than an ordinary coat.

[illegible]

pletely up-to-date unless it had included in its

[illegible]

where the outline of the shore was curved, or formed

[illegible]

own, especially at high water. For street lighting

[illegible]

lamps, although the healthy competition between the

[illegible]

opinion.

[illegible]

thanks to the author, said that, in regard to pavements, he considered that at the present day the chief trouble was rather with noise than with dust. He thought there should be something done in the way of compelling all vehicles to undergo a test before they were put on the roads.

[illegible]

said the great thing in planting trees in seaside towns was to give the trees adequate protection. He thought that formal planning of gardens on the front

[illegible]

ful, for if they attempted to imitate Nature the whole thing was a sham, and people saw it. Bandstands, he considered, should be kept as simple as possible, and they did not want so much ornament as some of the manufacturers put on the market.

Mr. T. G. Lumb (Blackpool) remarked that if the visitors came in the autumn and saw some of the storms they had to contend with they would quite realise the difficulty of tree planting.

Mr. A. Race (Barrow) said that what pleased him about the works at Morecambe was that, besides being works of great utility, they had been carried out in real good taste. This was a side of the work which was of great importance in all towns, and particularly in seaside and other holiday resorts, but was one which the municipal engineer sometimes neglected.

(To be continued.)

Claridge's Asphalte is specified for the covering of roofs [illegible] the new Sheffield telegraph offices in Sheffield.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in The Surveyor and Municipal and County Engineer, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News, New York.*

* By Reginald Ryves, Assoc.M.Inst.C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

ECONOMICAL SUPPLY OF HOT WATER TO ARTISANS' DWELLINGS.*

[illegible]

bedrooms, kitchen, scullery and bath-room combined,

[illegible]

electric light, at a rent of 6s. per week, or, say, £15 10s. per annum (not including rates).

In the kitchen is fixed a range of flues communicating with the copper, built directly at back in the scullery in the usual way. Between the copper and

[illegible]

heat when not required for the heating of the copper. The usual copper furnace door and frame is fixed; in front of this is an airtight door and frame; by this means the copper furnace is made airtight. When the copper is required for washing purposes this door is removed, and the copper used in the usual manner. There are also three soot doors. These give access to any part of the copper flues for cleaning purposes

[illegible]

using gunpowder.

The copper is provided with a cold supply, entering near the bottom, connected direct to main supply, and controlled by a stopcock, an open draw-off being fixed close to the top and continued over the bath, the connections to the copper being easily detached to allow for removal of copper if required without disturbing the brick or other pipes.

The bath is an ordinary 5-ft. (Sienna) roll-top, with brass trap and outlet, the waste being carried to the same outside gully as the sink pipe, all properly trapped. The bath is covered with a door or lid hinged to the wall, so that when the bath is not required for bathing purposes it is let down, and forms a seat or table for the washing tub or tray. The front of the bath is open so that it can be kept clean, and

[illegible]

feet, and can be drawn out when required for bathing

[illegible]

Having so far described the installation, let us see the result. The stopcock was turned on, copper filled, range fire lighted, airtight door placed in position, the horizontal damper lifted. The heat from the range then passed through the flue at back and circulated round the flue of the copper, thence up the chimney, and in less than forty minutes the water was quite hot, although the brickwork in copper and range was quite cold and new. The 10 gallons of water were, in fact, quite hot enough to give one a bath. The next day, after the fire had been working and the cooking done and damper again opened, the water was raised to almost boiling-point in a very short time. . . . This was obtained from the surplus heat, or heat that would have been passing up the back of range flues instead of, as in this case, circulating round the copper and giving the household that which is of all importance—hot water at a minimum cost.

[illegible]

found to be quite hot enough for a bath, although it had been standing during the night.

I daresay some of my critics will say: "But what about the copper? It will in time burn out." So do boilers; they also furr up. So do cisterns, tanks, and all taps and pipes. Why do coppers burn out? Builders and property owners know full well. The cause is not keeping the copper properly filled with water, and the portion above the average water line deteriorates; but by the system here described it will be seen that the copper always stands full of water, and the supply of hot water can only be obtained by turning on the stopcock and running in the cold water at the bottom. This raises the hot water, which then flows out of the top pipe into the bath.

I venture to say, as a practical man, that the life

[illegible] could be two or three times longer than under the ordinary conditions. Another great advantage claimed for this system is

[illegible] The Author [illegible] the Royal

[illegible]

[illegible] £10

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.
— MASSINGER. "The Fatal Dowry," Act ii. 2

CONTROL, MANAGEMENT AND MAINTENANCE OF RURAL ROADS.

To the Editor of THE SURVEYOR.

SIR,—Will you kindly [illegible] to the paper [illegible] Mr. J. Ford Hawkins, county surveyor of Berkshire, read at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham, and which appeared, together with a report of the ensuing discussion, in your last issue?

It is quite evident that Mr. Hawkins has satisfied himself that the only chance of salvation for the road and the ratepayer is that they should be bound hand and foot and delivered over to the county council and its surveyor.

"The smaller the authority, the less the chance of public-minded ability and [illegible] taking their share of duty to their country. . . . It would appear that most county councils are now alive to the growing needs of localities, and, with the assistance and guidance of the Road Board, they seem to be the natural authority for dealing with all such matters as road management. . . . Those who have efficiently carried out a system of direct management on their main roads could without much trouble design and carry out a system for managing all roads in counties, and there is little doubt that all ratepayers would benefit by it. . . . The writer does not put forward any present county scheme as ideal for the movement" —so that for the present the rural district councillor and the rural surveyor are allowed breathing time. When Mr. Hawkins finally decides on the best course to pursue, no doubt both specimens will immediately disappear.

I hold no brief for any rural district council or for any rural district councillor; the latter, as I know him, is a gentleman well able to take care of himself. It may, Sir, and may not be as the best interest of the road and the ratepayer that all roads should be directly controlled and maintained by the county councils, but surely, Sir, the case for the affirmative does not need bolstering in this fashion by one of the junior county surveyors!

Then, again, you report Mr. E. P. Hooley in the discussion: "They knew what rural councils meant. They knew the position of the rural surveyor, who was very much like a toad under a harrow." This is generalising with a vengeance. Just a word as to my own experience as rural surveyor—one of the toads under the harrow!

I was appointed surveyor to the rural district council of Andover in 1897, at which time and until 1912 the main roads were maintained by the rural council under contract with the county council. In 1899 the Andover Rural District Council commenced to use granite on some of their district roads. I have before me a copy of a letter, dated March, 1900, addressed by the Andover Rural District Council to the Hants County Council recommending the use of granite on some of the main roads within the Andover area on the ground that the use of local material on these roads was no longer economical. Granite was not used on the main roads in this district until 1902. The Andover Rural District Council, since 1897, have built eight steel girder and concrete bridges, restored and strengthened numerous other bridges, and have spent upwards of £1,500 on hauling and rolling plant. During this period I have not had a single recommendation refused. So much for the "toad under the harrow" theory.—Yours, &c.,

JOHN WORMALD.

Andover.
July 14, 1914.

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR,—As "Engineer" suggests it, I will most gladly deposit £25 if he can prove that he has "thirty years' personal experience in refining bitumen for road paving," conditionally that he deposits the like amount and he proves it in your columns. With all due respect I think others than your good self should judge. He may be trading on a very scanty knowledge of the refining of bitumen for mastic asphalt, which is as old as the hills. I expect him to prove his intimacy with the manipulation of natural bitumen for road work on the lines on which he has so often written.

I will risk a further £25, for sweet charity's sake, if he can refute the following: That he really has no right to pose as an engineer, as it might lead your readers to believe that he writes as a municipal engineer. That he is interested in a concern now exploiting a pitch compound for road work (he writes on May 1st that pitch has "failed terribly"). He is now selling natural bitumen for road work which is added to pitch, &c., which must be to his knowledge (he writes on May 1st that "natural bitumen should never be mixed or laid in connection with any coal-tar product, as the latter destroys the good properties of the bitumen"). That others interested with his concern have subscribed their valuable support to his remarks in your columns, which are as inaccurate as they are insincere.

I will point out to you the closing remark in my last letter: "When 'Engineer' gives you the same right you have my permission to publish my full name, address and credentials," and will go further and give you permission to hand my name to anyone interested in this discussion who wishes to have it.—Yours, &c.,

NOT SO DUSTY.

CHICAGO ROADS EXHIBITION.

To the Editor of THE SURVEYOR.

SIR,—It will be of interest to manufacturers of road plant in this country to know that in connection with the convention of the American Road Building Association, which takes place this year in Chicago, an exhibition of machinery and material will be held.

The exhibition commences on December 14th, and is to be in the International Amphitheatre, which affords the best facilities of any building in the United States for such an exposition.

There is every reason to believe that this meeting will be the greatest gathering of those directly interested in highway construction that has ever been held anywhere.

I enclose a plan of the building, with information giving the conditions under which the exhibition will be held.

Should any of your readers be interested, I would be glad to furnish any particulars that may be desired. —Yours, &c.,

JOHN HUTCHINSON.

11 Tothill-street,
Westminster, S.W.
July 14, 1914.

Civic Exhibition at Dublin.—The opening of the Civic Exhibition in Dublin, the object of which is to educate public representatives, and the public generally, on sanitation, town planning, and the housing of the working classes, took place on Wednesday. The Countess of Aberdeen is largely responsible for the idea, which appears to have aroused a good deal of interest throughout Ireland. Representatives of fifty-seven corporations and councils in Ireland took part in a procession from the Mansion House to the exhibition.

Motorists and Signposting.—Presiding at the annual meeting of the Automobile Association, which was held in London on Wednesday, Mr. W. Joynson Hicks, M.P., referred to the work of that body in signposting the roads. He said that no doubt local authorities should do the work, but they had too much on hand, and many of them did not do the work they ought. He hoped their signposting would be brought up to the level of foreign countries. Our roads were better than those of any foreign country in the world, but not with regard to direction and sign posts.

Institution of Municipal and County Engineers.

ANNUAL MEETING AT CHELTENHAM: DISCUSSIONS IN ROADS SECTION.

At the Friday sitting of the conference held in connection with the annual meeting of the Institution of Municipal and County Engineers at Cheltenham, Mr. H. T. Wakelam, M.INST.C.E., county engineer of Middlesex, presided over the Roads Section. The first paper submitted for discussion was one entitled

SOME PRACTICAL POINTS ON MODERN ROAD WORK.

The author of the contribution, which we reproduce on page [illegible] of this present issue, was Mr. W. H. Maxwell, Assoc.M.INST.C.E., borough surveyor and engineer, Tunbridge Wells.

Mr. J. S. Brodie (Blackpool) contended that the [illegible] advice by the author, but he for one was not inclined to take that advice. He thought some of it was quite sound advice, but the author went too far. Of course, they all knew that the quality of tar available for this work was variable and unreliable. As engineers it was their business to see that the tar they used for tar-macadam was of the right quality. He hoped nobody would embark on making tar-macadam with a tar that was unsuitable for the purpose, or they would come to grief. In his own town, if they would hand the tar to him quite free, and cart it to his works department free of cost, he would say: "No, I do not want it; I will go elsewhere and pay for it." No tar which was unsuitable should be used at all. Then Mr. Maxwell said: "Good, fine weather is an important factor for successful work." He did not agree with that; but he thought they could lay down tar-macadam in almost all weathers, save and except a heavy thunderstorm, or when 5 in. or 6 in. of snow was lying on the ground. Those might be exceptional circumstances. Then Mr. Maxwell said: "Tar-macadam is hopeless on a weak, yielding foundation." There the author had hit the nail on the head. It was no use putting it on a weak foundation. The first thing was to put their money into their foundation, and begin, as they would a house, putting in a good foundation, and then their superstructure might be worth considering after all. Then Mr. Maxwell said: "Where there is much traffic a continual watch must be kept on the work for some time after it has been completed, which considerably adds to its cost." He did not agree with that at all. If it was properly laid he did not think it needed any watching; it took care of itself. In Blackpool they had some 300 or 400 acres of tar-macadam, and it was giving very satisfactory results. If properly mixed and made it required practically no watching. In regard to the liability to creep, there again he did not agree with the author. He thought with properly mixed tar-macadam the hot weather would have no effect on it whatever. Then the author said: "The cost of tar-macadam is, as a rule, much beyond that of a granite tar-painted surface, and its serviceable life cannot always be so accurately predicted." Neither of those propositions did he agree with. He hoped the author would not consider he was acting disrespectfully in the remarks he had made. They were offered in good faith, and with the intention to correct erroneous opinions on this subject. He offered them as such, and he hoped Mr. Maxwell would not take offence at what he had said.

Mr. E. WILLIS (Chiswick) said that undoubtedly Mr. Maxwell's paper gave them food for thought. He should like to differ, though he regretted to differ, as to mechanical haulage practically taking the place of horse haulage under the majority of conditions. He thought they had to go carefully—especially in respect of the smaller municipalities—in mechanical haulage. Where they had to fetch their goods a long distance, or cart their refuse over long distances, they could use mechanical haulage with advantage; but he certainly thought they could not do that in the smaller districts. With regard to the collection of information and statistics, he was thoroughly in sympathy with Mr. Maxwell in regard to that matter. Undoubtedly the most careful records should be kept as regarded every department of a municipal office. He thought they could not be too careful in keeping the records of every road in the district, with the maintenance of every road, as far as possible, analysing these results from time to time, and not merely that they could trace not only the value of certain road material, but they could analyse as to whether there was any special reason for one road costing more than another for its traffic conditions. He should like to emphasise the importance on main roads and important thoroughfares of taking a periodical census of traffic. That should prove useful in bringing the results down to a standard unit.

Mr. W. Greenway Royston said that he made an experiment in 1903 with a road treated with ordinary tar [illegible] The surface material was scarified by hand, and 3 in. of granite was put on with ordinary tar and rolled in with chippings. Although it was a very wet season when the work was done it had stood, and was as good as any piece of road which had been tar-painted; it was still standing, and showed very little wear on the surface. The [illegible] had been done to it had been a little tar-painting in the centre where the traffic had worn it. With regard to steam haulage for road material, he had used that for country work where they had to convey it from 4 to 12 miles from a railway station. They carried double the quantity of material for the same cost, with no more damage to the road—if the drivers were careful—than they had with horse haulage. And it did not interfere with the ordinary traffic so much as horse haulage as on the hills horses were often drawn across the roads to ease them, and this interrupted the ordinary traffic.

Mr. H. PERCY BOULNOIS (Westminster) said he thought Mr. Maxwell's paper was exceedingly valuable. Personally, he thought there was still a large field for tar-macadam. It had many advantages over other forms of road making. It could be laid in almost any weather, and with care it could be laid cheaply and made excellent roads. Wherever he went he found examples of tar-macadam quite equal if not better than modern methods.

Mr. W. H. MAXWELL, in replying, said he was pleased that his paper had evoked so many adverse criticisms, and he felt very much indebted to Mr. Brodie for disagreeing with so many points, because unless there was disagreement he did not think there was much food for discussion. He could only say that Mr. Brodie's experience with tar-macadam had been a little more favourable than his own in some respects. The great trouble he had experienced had been with regard to traction engine traffic. There was no other traffic that one feared, so far as tar-macadam was concerned. When they got a 16-ton engine hauling three wagons loaded with bricks almost to breaking point, then he thought a new tar-macadam road did want watching. With regard to tar, it was a thing which did want a lot of attention. His experience was that they got a very good tar one day, and they were likely to get something else the next day unless they were very careful. It was not every corporation that would pay an expert chemist to watch these things. Although he had raised the points one to seven of difficulties in regard to tar-macadam, it was not to discourage its use. His object was to mention some of his own difficulties, and to hear other members express what their experience had been in the hope that others had been more fortunate than himself. With regard to the cost of tar-macadam, that was a very important point, but he supposed that a good deal must depend upon the locality in which it was done. If they could get the stone at an economical rate—limestone, Kent rag, or some forms of granite—they got a cheap tar-macadam; but if they were in a part of the country where it was difficult to get stone, then they had to pay some shillings per ton for carriage, and the price was altogether different. Mr. Willis had said that mechanical haulage should be limited in some of the smaller districts. His point was, what were they to do if they could not get horses and were driven to it? His experience was that he could not get horses, and there was no alternative to mechanical haulage. As to cost, one would not develop mechanical haulage on the roads, but when nothing else was to be got what were they to do?

The subject of the next paper submitted to the meeting was

GROUTING AND PENETRATING METHODS OF ROAD SURFACES, &c.

Mr. George Green, M.INST.C.E., borough engineer, Wolverhampton, was the author of the paper, which will be found on p. 80 of this issue.

Mr. E. R. Capon (Epsom) moved a vote of thanks to the author of the paper. He had laid Rocmac which had been down for 2½ years, and it certainly did give a good foothold for horses. One trouble was that it was slightly dusty in summertime. He had been in communication with the makers as to tarring the surface, and they had advised him that tar should not be put on Rocmac. Otherwise he had found that roads made with Rocmac were the cleanest he had got.

A Member: Do you say that tar should not be put on Rocmac?

Mr. Capon: The manufacturers advise me not to tar Rocmac. I have had no experience of tarring it.

Mr. G. W. Lacey (Oswestry) said he wished to hear the opinion of members on the grouting method of construction, because he observed in Mr. Maxwell's paper he had come to the conclusion that this method was less satisfactory than tar-macadam. He also accused that type of pavement of becoming more slippery in the winter time. He had always been under the impression that they could obtain a better foothold with a grouted road surface than with tar-macadam. He was at the present time considering the putting down of a section of Plascom road, with the object of obtaining a surface which would be less slippery than would be the ordinary smooth surface of tar-macadam. With regard to Mr. Green's method of laying Rocmac and Glutrin, the Great Western Railway laid their road with Rocmac on the ordinary method of spreading the Rocmac preparation with the ordinary chippings, and rolling until the material filled the interstices of the stone. He watched that very carefully, and one felt prompted to ask whether the rolling was ever going to cease before they obtained a properly closed crust, and it struck him as a method one would not care to adopt in the centre of the town where they had traffic constantly passing over and hardly able to divert it. It struck him if the material was laid in the form of a concrete it would be a very much better system. He should like to ask whether the laying of Rocmac or Glutrin was less or more by this method than by the ordinary method, and also to what extent afterwards he rolled the crust. He took it that it must require considerable rolling, and made in that form it would bear very little rolling indeed. A Rocmac road was rather a dusty road, and last winter it was a very muddy road too. That was probably due to the heavy amount of rolling and the limestone dust put in to fill up the interstices of the road, and which the rolling did not complete. He was surprised to hear what Mr. Capon had said, because he had heard from one of the representatives of the company that it was advisable to tar the surface. If they had changed their methods perhaps those who had tarred a Rocmac road would give them the benefit of their experience.

Mr. J. Edey (St. Neots) remarked that previous to last year there was a disinclination on the part of the proprietors of Rocmac to tar the surface, but questioning their representative, he was advised to tar it early in the season, so that before wintry or wet weather set in the tar would have worn off. He was perfectly satisfied with its wearing qualities. He preferred it in some places to tar-macadam, and he could do it at the same price—viz., 2s. 9d. per super. yard. The chief difficulty was rolling. With the concreting process less rolling was required than if laid in matrix, but even then they could reckon on 25 per cent more rolling than with ordinary material.

Mr. E. Worrall (Stretford): What thickness?

Mr. Edey: Three inches consolidated. He had also laid tar-macadam for ten years, and for streets in the town he preferred that to Rocmac, because on the latter there was more or less dust, and a good deal of vibration. They could notice the dust of vehicles running off tar-macadam on to Rocmac. But in exposed and outside situations he thought there was a future for Rocmac. He had also used Vianex, which was made by the Barnstaple stone and cement people. That was made the same as Rocmac, and it required less rolling.

Mr. A. J. Price (Lytham) remarked that he had not had any experience with Rocmac, though he had seen the little which Mr. Brodie had laid at Blackpool; but, with regard to tar-painting, he had done a fair amount of that with satisfactory results. About nine years ago he tar-painted the principal road along his sea front, and he had never had any necessity to do more than put ¼-in. chippings, with which he had covered the road ever since. In other words, he had been putting a thin coat of granite on to the road, which had practically prevented anything like ordinary repairs having to be carried out. With regard to tar-painting, they must have their tar in a satisfactory condition. All tar-macadam or tar-painting depended upon the quality of the tar. If they had not got a decent tar they could not make a decent tar-macadam with any material. If they got a proper tar they could make a satisfactory tar road with almost any material. They could bind the tar with almost any material. For himself, he had always used granite for sealing the tar upon the roads. It was harder, it did not create any dust, like limestone or softer materials, and he thought they got better value for their money, because it wore longer. With regard to Rocmac, a point in its favour was that it could be laid in winter; but it was not acting in the way it was supposed to do. It was not keeping down dust in summer, and it was muddy in winter. Surely if they had got to tar-paint a Rocmac road, they might as well do it at once, when they could do it as well and cheaply. He did not see any difficulty in laying down tar-macadam, or tar-painting a road and allowing the traffic to go on it. He had laid down a large amount of such work, and never interfered with the traffic. He had always done half a road at a time, and allowed the traffic to go on the other half. A tar-macadam road depended almost as much on the rolling as on the tar. He preferred a very fine granite for sealing the surface, because he believed if they prevented a road breaking up and disintegrating they must have the surface sealed with a fine coat. If the water got into it the road would soon break up.

Mr. P. Johns (Maidenhead) hoped the discussion would not close without eliciting some information which would enable them to answer one of the queries raised by Mr. Green—some class of road making compatible with modern methods which it was possible to carry out during the winter months. He, unfortunately, was not able to give any information as to any such method. But he did want to emphasise a point raised by Mr. Green. In a small borough like Maidenhead he found that any horse-hire for road making was required at the same time as the horse-hire for watering. He had twelve horses owned by the corporation. They used under the old methods of water-bound roads to be used economically throughout the whole year in watering and scavenging during the summer months, and for road making in the winter months. Those days had passed away for the majority of their roads, and he had found a great dearth of horses for hire during the summer months. His demands on a fine day for watering, as well as tar-painting, often amounted to thirty horses. They had to be ordered over night, and if rain came on he had great difficulty in finding them profitable employment. If the paper elicited any methods of road making which could be carried out in winter it would be of real benefit. He should like the experience of any of them who had carried out tar-macadam or tar-grouting during the winter months. In the tar-grouting he was carrying out in Maidenhead he used the Ellis James spraying machine. They had been successful in passing Tarvia through the sprayer. It was absolutely essential that the road should receive the sealing coat when dry, and everything depended upon the sealing coat. The success of that method of road making at a cost of about 1s. 9d. or 1s. 10d. per yard, made complete, had been really wonderful, and if any of them had not tried it—he was not advertising Tarvia—they would be surprised at the excellent results which could be obtained, but that could only be done in the finest weather—and there was his real difficulty.

Mr. S. S. Haywood (Brighouse) questioned the suggestion that tarring on a Rocmac road had not been successful. He had had a Rocmac road for five years, and there was the difficulty of dust in summer and mud in winter. Rather against the advice of the makers, he took his courage in his own hands and tarred the road, and in his experience there had been no damage to it. The only difficulty he had

[illegible]

[illegible]

these roads there was not sufficient care taken in the selection of the stone as with a water-bound road, and that must have an effect on the life of the road. Perhaps the author would give some information [illegible] with ordinary macadam water-bound roads. Then as to pitching and surfacing, Was there any difficulty [illegible] in all roads where the traffic, being concentrated, must wear more than the portion which did not get so [illegible] The question had already been raised with regard to the tar-spraying of these special road surfaces. He was inclined to agree with some of the previous speakers who had pointed out that if they were going to put in special surfaces, and then had to tar them, they were not getting very far forward in road surfacing. It seemed to him they wanted something that would meet all conditions; otherwise they might as well use the old water-bound macadam. Was [illegible] to go to the road [illegible] surface? His answer was Yes. He would give them a case. One was three winters [illegible] towards the end of November. The system he used was a three-wearing system, putting down a coarse, medium, and fine or sealing coat. The weather was extremely good up to the middle of December, and after then it could not have been worse—it rained every day. The road was carried forward on the three layers: and when they got into this wet weather he was faced with the difficulty of a waterlogged tar-macadam. The length of road that was being laid was unfortunately dead level. He left the sealing coat off until after the Christmas holidays. Fortunately, they then got two or three days dry, sufficient to allow him to get on the sealing coat, though he would not say that the tar-macadam was absolutely dry. That road had been laid more than two years, and if they went over it to-day they could not tell which was laid in the bad weather. Last year he was up against a worse proposition, as he had snow come down on tar-macadam, and had to suspend the work until the snow thawed out of the road surface. As soon as the snow had thawed he adopted the same principle as before, and that road [illegible] the effect from the snow. Mr. Hadfield, of Sheffield, had just the same experience [illegible] his roads in winter as in summer, and there was no detriment to the road.

Mr. T. Frank (Newark) said some of the speakers had asked for particulars as to a Rocmac road. He laid two lengths of that type of road four years ago, and at that time no Rocmac roads had been tar-painted. Rocmac was particularly useful for roads on a gradient, as the rough surface gave a hold for the horses' feet. Mr. Gullan said they lost the advantage of the proprietary articles if they tar-painted them. But if they could get a road material which could be held together by a rough surface so that the horses could get a hold for their feet on it, it was a great advantage. He found that Rocmac gave that foothold. And the following summer the road, laid on a gradient, was tar-painted. He found the Rocmac in wet weather to be the cleanest road. Rocmac, even if it had no tar upon it, was less dusty than an ordinary water-bound macadam road. They could take the cost of a Rocmac road as being 6d. per square yard over and above an ordinary water-bound macadam road, using the same aggregate. Some had mentioned tar-macadam being carried out in the winter months. He was situate in a district where a good deal of Tarmac was being used. They were making that material so good they could not get it for love or money, and in his district the main roads had to be carried out in the winter months. There was no difficulty or danger in carrying it out if they got the sealing coat put on in dry weather. He had used granite chippings with Tarmac in order to get a different wearing material. The Tarmac was [illegible] chippings on that they got two materials wearing at different rates, and they got a rather better footway for vehicular traffic.

Mr. A. G. Bradshaw (Lancaster) said he wished to tell them of an instance of some slag tar-macadam he laid in wet weather. The first piece he laid was on the bridge on the main west road, which carried the whole of the through traffic Skirton Bridge. There was on the bridge a tramway track and an ordinary water-bound piece of road. It became [illegible] to excavate all the water-bound macadam [illegible] a width of about 8 ft. So when they had excavated it, and rain came on, there was no means of escape for the water. A heavy thunderstorm came on, and this shallow place filled with water. There being so much traffic on the bridge, it was allowed to sink away, but it left the surface muddy. This tar-macadam was laid, and, despite the condition, it did not seem to have any ill-effect. It had now been there eighteen months, and was in good condition, [illegible] the traffic was so great that the ordinary water-bound macadam had to be renewed three times a year. The tar-macadam was a slag macadam, made in Wigan by the Wigan Coal and Iron Company. It was all mixed by hand, and laid on hot plates on which the tar-macadam was allowed to remain all night, so that all surface tar was allowed to cook itself off the stone during the night. He had laid a length of Rocmac, which was laid 5 in. deep, and the cost worked out at 4s. 3d. per yard.

Mr. Price: What is the cost of the tar-macadam?

Mr. Bradshaw: About 3s. 3d. He did not believe in putting a 3-in. coat down; he preferred to put 4 in. It was worth the initial cost. If they laid 3 in., and it was consolidated, if it became consolidated there was very little of the original coat left. If they started with a 4-in. coat they had a little more latitude. As to tar-spraying, he entirely disagreed with those speakers who said that tar-spraying would last through the winter. On the main road of Lancaster they had tried putting it on thin and thick; they had got to get it off again in the winter, especially in the municipal area. Public opinion compelled them to take it off. In the discussion on Mr. Maxwell's paper Mr. Willis had expressed the opinion that surveyors ought to keep very accurate statistics of all the work they had in hand. They had all paid visits to the Local Government Board offices in their career. They had their tale all very nicely thought out, and then they found that the Local Government Board officials knew more about their own town than they did themselves. His experience was that they would not have time to get those statistics pigeonholed. They would never find the efficiency they had in the Post Office and other branches of the Civil Service with the staffs they had in their offices. He should also like to refer to wood paving. They had been laying wood paving for twenty years. They absolutely found that wood pavement was the pavement. They got eighteen years' life out of wood pavement.

The Chairman (Mr. H. T. Wakelam): What kind of wood?

Mr. Bradshaw: Softwood, creosoted deals. They had at times used beech blocks, but they had been a failure, and had not the life that creosoted deal blocks had. There was no doubt that in London they had solved the traffic problem. (A Voice: No!) He meant as carrying the weight they had solved it by wood. He believed they would live to see the day when our highways were kept in the same state of perfection as those of London to-day.

Mr. C. F. Gettings (Worcestershire) asked whether before applying the material the author had found it necessary to put in a foundation. His experience was that where they had an existing tar-macadam road it generally was in the best condition before they applied any concrete construction, and that where they tried to put on a layer which was generally said to be 3 in., but was usually 4 in., they were subject to getting an uneven road. He should like to ask Mr. Green whether he had dried the whole of his stone or whether he had surface-dried it; also what filler he had found best for his mixture, and also what method of distribution he had found best; whether he had found any difficulty in getting an even distribution, and getting the whole of the voids absolutely filled in. His experience was that they were absolutely in the hands of the men, and that in some cases they got their material filled in solid

and in other very [illegible]. He did not know whether Mr. Green had put out [illegible] of [illegible] treated work. He had [illegible] been deceived himself. [illegible] the work all right to lay [illegible] and in [illegible] in pitch grouting or [illegible] of the terms of contract [illegible]. In the outlying [illegible] under great difficulties in having to [illegible] traffic forward while the work was [illegible]. Recently Mr. Green had been in the position to close up a street while the work was in progress. As to Rocmac, it was generally said that it could be used in any weather. He was afraid he could not agree with that. He had a case only last [illegible] in one of the [illegible] districts in his county, where Rocmac was [illegible]. It was commenced in October, and the work went on very well so long as the weather was good, but immediately they got indifferent weather they found that the material had not set to a hard [illegible] sufficient to put traffic on it. In that case they had very heavy traffic going over the road from a quarry. There were four or five light tractors going over it daily. It was necessary to [illegible] half the road at a time. Under those conditions it was quite impossible to put Rocmac or anything of that nature in the [illegible] months. They abandoned the work for the time being, and it was again commenced some few weeks ago. They found that the Rocmac set, and they could put the traffic on in about four days. He was [illegible] with some of the speakers that it was not policy to put tar upon a Rocmac surface. He had found it advantageous in several cases. In fact, if it had not been tar-painted in two cases the road would have been disintegrated. He had been interested in the remarks of Mr. Gullan about putting tar-macadam down in any weather. He was afraid he was in the minority, but he could not altogether agree with what some of the speakers had stated. He was looking at it from the point of view of putting it down, and where they could not divert the traffic. In boroughs where they could divert the traffic, it was different altogether. He had not the advantage of knowing whether Mr. Gullan had been in the position to stop his traffic, or whether he had applied the material hot or cold. It seemed to him, in many cases, where they had tried to keep the traffic going, they had been forced to put it down in the winter, but this last winter he stopped it. He found where they tried to carry on the traffic they got a certain amount of foreign matter carried on to their 1½-in. coat, and he could not agree that it was the best method to let that foreign matter get in the road before they put the sealing coat on. If they got that foreign matter in their 1½-in. coat, he could not conceive how they could get the best life out of their material.

Mr. H. F. GULLAN (Belfast) said the material that was laid was cold tar-macadam that had been made not less than three weeks, much of it considerably more than that period. The material was never sent out fresh. The stuff was allowed to remain in the depot not less than three weeks to mature. The secret as to whether the work could be satisfactorily done in the winter time lay in the material. If they had an inferior mixture, or the stone was not dried when applied, he could understand failure. The traffic was kept going while the work was in progress. It was an 18-ft. road. The road was split in the middle; one half of the road was laid for a distance of 100 yds. or 200 yds., and when the work was completed about 7 ft. 6 in. was opened, and the traffic allowed to take that portion only. The other portion of the road was then laid.

Mr. PRICE asked whether all the stone came out of store.

Mr. GULLAN: Yes. If they put the material on without the tar being properly matured, the ammonia came out on the surface.

Alderman BAINBRIDGE (Stockton) asked whether it was the experience of most of the engineers present when they ordered a 10-ton roller it generally weighed from 13 to 14 tons when they received it. They had ordered one specially to be 10 tons and it weighed 13 tons 12 cwt. They had in their district abnormally heavy traffic, and from Manchester and Sheffield vehicles weighing 40 tons, drawn by two traction engines, had been coming over their roads, which had been laid down with a good tar-macadam surface. Was it their experience that tar-macadam was a suitable road for 40 tons with two heavy engines attached, or would it be more advantageous to put in a concrete foundation, 2 in. or 3 in. of sand, and 4-in. whinstone cubes.

Mr. MEASHAM LEE (Karachi) added his personal thanks to Mr. Green for having put this paper before them, and particularly as it had enabled him to listen to an extremely interesting discussion on the question of treating road surfaces. He certainly should not attempt to criticise any of those methods that had been advocated by various speakers. He could look upon them as giving him information which could be [illegible] being five years out of England it was certainly an additional interest to listen to the discussion. Some of the speakers had [illegible] in their own towns. He might say, with regard to his district, they were not troubled with the difficulty of drying their stone, and considering that they only got rain on about ten days in the year, they were not very much troubled whether they should lay tar-macadam in wet weather. He could say they were troubled with dust, particularly as he was in a district which is composed of granite, and they were troubled with the same traffic as in this country. They had the fast-moving traffic with a large increase in motor vehicles, and they had to make their road surfaces to meet the new conditions. He found that the ordinary commercial tar was not suitable for treating the roads. So far as the coating of tar-macadam was concerned, he had done some little work in that way, especially as the cost of the tar material, which he had to put into the road did not seem to be justified. It was far more satisfactory to put in tar-macadam altogether or do tar-painting. He wished he could get the same results as Mr. Price, who said he had a tar road which had stood seven years. (Mr. Price: Nine years.) He had difficulty in getting his to last seven months. He had come to the conclusion that Rocmac was not the material he wanted in India.

Mr. J. YOUNG (Ayr) said he had laid three or four streets with Rocmac on the Gladwell system, and the concrete method, and he preferred very much the concrete method. If they could get a good, rough surface, and could prevent clogging of the lime chippings on the surface, and get that thoroughly brushed on and tar properly spread, they would get a thoroughly satisfactory road; but they must not attempt to tar-spray a smooth surface of Rocmac; that was his experience. With regard to water-bound macadam, he heard Mr. Boulnois say that the days of water-bound macadam were over. He did not think so. He thought there was some splendid water-bound macadam to be made, and that they would still hold on it, and tar-spray it. He hoped they would when they were kept down to minimum cost, and had to produce satisfactory surfaces for motor traffic. They would find in counties that roads which were tar-sprayed made excellent roads. In Scotland they were somewhat in an experimental stage; they had been hanging on to the skirts of England as regarded tar-macadam. A committee of the Scottish District of the institution had approached and were successful in getting the Road Board to contribute 75 per cent of the cost of eight or nine experimental strips of road in Scotland. Those were being put down this summer, and by the next annual meeting some very educative results would be forthcoming. He was sorry Mr. Walker Smith was not there, or he could have given them details, and how he got the money out of the Road Board.

Mr. J. S. BRODIE (Blackpool): Are the experimental strips all in one district.

Mr. YOUNG: No; all over Scotland. They had selected districts of different rainfalls and climatic conditions, and they required to have these standardised before they could make proper comparisons. As to tar-grouting, he thought that was a satisfactory method of renovating an ordinary macadam road. Laying down 1 in. or 1½ in. of whinstone metalling, roll that dry, put a little chippings on it to fill up the interstices, roll it again, tar it, put on more chippings, and roll it again. He had to lay down a road last autumn on that method, and it had preserved a beautiful skin all the winter. Another he laid 3 in. thick in front of the entrance of an ice factory, where there were a number of motor vehicles going, and it stood exceedingly well. The skin was hardly broken.

Mr. MATTHEW JONES (Chester) said the little experience he had in the tar-spraying of roads might help some in doubt. He tar-sprayed on the average about 80,000 yds. of water-bound surface each year. The average cost ran out at about a penny per square yard. That included the thorough brushing of the dust off the roads, tar-spraying and spreading with granite chippings. He had to pay 7s. 8d. per ton for

granite chippings. One street in Chester, Northgate-street, used to cost 8d. or 9d. per yard for resurfacing. He might say that for the past five years Northgate-street had not cost more than a penny per yard for tar-spraying, and was in very good condition. The chippings he put on seemed to fill up and would last for three months without coming down to the ordinary macadam. He was a great believer in tar-spraying if it was done in the proper way and the dust brushed off the road. They could put down tar-macadam or Rocmac, and he did not think any makers would guarantee them more than five or six years' life, and then they had got to re-start pitching. A water-bound road tar-sprayed cost 1d. per yard instead of 8d. or 9d. If he were to put down tar-macadam it would cost him 2s. 9d. or 3s. per yard, and in three years he should have to start tar-spraying it.

Mr. A. J. Webb (Hendon) thanked Mr. Green for the opportunity of discussing this paper, which was of interest to all concerned in road making. Mr. Jones claimed to tar-spray his roads for 1d. per yard super. In Middlesex they could not do it under 2½d. per yard. He did not know what he paid for labour and for carting. Mr. Jones said his material cost 7s. 8d. per ton; he could not understand it. Another point was the water-bound roads. They got on secondary roads very excellent results from water-bound macadam roads when they had been tar-painted the second year; but where they had a constant stream of motor 'bus traffic they could not maintain a good service on the road; it was in waves. He had seen 200 tons of granite put on one-third of a mile of road, and in three months the road was in bad condition. He did not know how they could maintain a good surface on a tarred macadam road with heavy motor traffic. In his experience such roads were not suitable, and would be a failure with the heavy motor 'bus traffic they had at the present time.

Mr. Jones: I took the precaution to say that Chester was a residential city, not a district like Hendon.

Mr. G. W. Lacey (Oswestry) said that a week ago they had a torrential downpour of 2·62 in. of rain falling in the space of an hour. The effect of this was that certain watercourses burst their culverts and rushed down at tremendous velocity through the lower part of the town. Some of those roads were not tar-sprayed. In every case where the road had not been tar-sprayed the volume of water covered the surface, and almost every particle of binding material was washed out of the road; but where the road had been tar-sprayed not the slightest damage was done to the surface. If tar-spraying would stand abrasive action in that way, everyone would see that it must be of great value in withstanding traffic. It would not stand motor 'bus traffic, but his experience had shown him its value as a binder on a water-bound road.

Mr. Green, in reply, said Mr. Capon asked as to the tarring of Rocmac. He had the same advice from the makers: "Do not tar-spray it." But he found after allowing it to have one winter over it, with the frost and the rain, the weather had had its worst effect on the lime, and it could be safely done. With regard to tarring, it was quite safe after the first winter or the first six months. Mr. Lacey asked if Rocmac afforded a better foothold for horses. He thought that was one of its strong points. He had laid it on a gradient of 1 in 19. It had a tramway in the centre, and he put Rocmac on because he could not put a smooth, tarred surface. Tarring must make it a little more smooth, but there was a roughness about Rocmac which remained through an ordinary coat of tar-paint. It did take less rolling when made in the concrete form. It was a very considerable saving in labour and in rolling, and therefore cost less. Mr. Edey did not recommend the tarring of Rocmac. He thought they all had their differences. They all had their own opinions. He did not think they could apply any general rule. What might apply in Wolverhampton might not apply in a county, or in every town. The traffic of one town was more muddy and greasy than another town, and they had to make allowance for that kind of thing. Mr. Price had mentioned that he tar-painted his sea front road every year. That applied to himself. He had also miles of Tarmac. He thought it was wise if they had any heavy traffic to tar-paint and coat with chippings every year. It was a very economical custom. The difficulty Mr. Johns had experienced in getting tarred materials was very similar to his own. He had no sooner commenced to make a tar-macadam road than he had to ring up the makers and ask why the material was not coming. The invariable answer was that they had had a breakdown in the machinery. At first he innocently thought they were speaking the truth, but he found all surveyors had the same explanation given to them. It must be very bad machinery was all he could say. He could lay Tarmac for 2s. 6d. or 2s. 9d. per yard.

Mr. J. S. Brodie: What thickness?

Mr. Green: Four inches rolled down to three. He lived within carting distance of the Tarmac works, which was a very great advantage. Mr. Gullan asked the price for the Rocmac. He found he could lay Rocmac or Glutrin with Clee Hill or other similar stone for 3s. 9d. per yard. He was rather near to it.

Mr. Measham Lee (Karachi): What does Clee Hill stone cost?

Mr. Green: Nine shillings a ton.

Mr. Johns: My granite costs 13s.

Mr. Green: With regard to the comparison of life, he should think the life was about three times that of water-bound macadam. They laid all these special things under special traffic, and the prices and the life were not comparable. Then he was asked if he had any difficulty as to pitching. He found that very small indeed. With regard to tar-spraying, it was rather suggested that if they had to tar-spray Rocmac they made it much more expensive. He, personally, tar-sprayed his macadam roads in every case to add life to them, and so that they should continue to give the best results. He understood that Mr. Gullan could lay Tarmac in winter as well as in summer, but, personally, he preferred to do it in dry weather. Mr. Franks, of Newark, seemed to agree with his remarks as to tar-painting upon Rocmac. He knew the roads were very good in Newark, because he was there recently; but he was afraid they had not the amount of traffic they ran against in the larger provincial towns. Mr. Bradshaw did not seem to think that tar-spraying would last through the winter. He thought that depended on the character of the road which was tar-sprayed. He had some roads which had been tar-sprayed for years with never any suggestion of lifting; but he had others which always came up in winter. He had hesitated to tar-spray any road which would not stand the winter through with it on. Mr. Gettings asked about putting in a foundation for tar-macadam roads. He thought that was absolutely necessary. He thought it was a waste of money to lay Tarmac on a road unless it had a good foundation and was drained. Where he tar-grouted in the ordinary way he did not dry the stone. He trusted to doing it in fine weather. He did it with the ordinary refined tar in fine weather. He had no means of drying the stone, and it would be very costly if one had to do that. Rocmac did take longer to set than tar-macadam; but all these roads would be better if allowed to rest a few days before traffic was put on. He always tried to do roads in Tarmac one-half at a time, so that the traffic did not go on it until it had set. Mr. Bainbridge said that 10-ton rollers always weighed more than 10 tons. He had found that a 7-ton roller was an exceedingly useful thing for Tarmac and things of that kind. He had given up a 10-ton roller, and had a 15-ton and a 7-ton. As to Mr Measham Lee, he had no doubt that there were many gentlemen present who would be glad to go over to India and give him expert advice as to laying dust at the proper fee.

Mr. Measham Lee: Would you guarantee success?

Mr. Green said, with regard to Mr. Jones, of Chester, he could not do tar-spraying so cheaply. It cost him about 2d. per yard. He cross-questioned his foreman as to why it was costing more, and when he explained that he was putting on more material he complimented him, and he found that the more they used in reason the better it was and the cheaper in the long run.

CHAIRMAN'S REVIEW OF DISCUSSIONS.

The Chairman (Mr. H. T. Wakelam) said he would like to add a few remarks in connection with what had been said with regard to the different papers. He should like to congratulate the authors and the members on the very interesting and able papers they had had before them for discussion in the Roads Section of the conference. The papers were prepared for criticism, and he was quite sure that the writers would take the adverse criticisms in the spirit in which they had been made by the contributors to the

discussion. He certainly thought that some good should come from the discussions which they had had in connection with the subjects treated by the papers. Mr. Boulnois had said that the traffic on the roads was bound to undergo a great change. He thought everyone who had had anything to do with roads during the last two or three years would confirm Mr. Boulnois' statement. There was no doubt that the traffic on the roads was changing in an extraordinary manner in its character. If they stood near to Westminster Abbey for five or ten minutes and noticed the character of the vehicles which passed that spot, and compared them with the vehicles which passed there four or five years ago, no one would dispute the accuracy of Mr. Boulnois' words. Mr. Boulnois also said that proper provision must be made for the new kind of traffic. No one would question that statement. They had to try and obtain materials and systems of management which would meet the constant increase of traffic in all directions, and also the varying character of the vehicles they now saw on the roads compared with what they had to contend with heretofore. Mr. Gullan, in speaking on Mr. Boulnois' paper, raised a very pertinent point as to a practical knowledge of the subject as against a theoretical knowledge. Personally, he was one of those who thought that practice was of a great deal more value than theory in road construction. Common sense was one of the greatest attributes that an engineer could possess in regard to road construction. The theorist sticks to a particular line; at least, that was his experience of the inveterate theorist. He could not look so far ahead as the man with practical ideas could, and as was mentioned by one of the speakers, it was absolutely ridiculous to draw a cast-iron line between theory and practice on the subject of road making. Combine them if they would, but he was a believer in the old saying, "Give me an ounce of practice before a ton of theory." Mr. Sinnott's paper and his remarks were of a very interesting character. Mr. Sinnott was a man of very broad views and experience in engineering works. He looked upon Mr. Sinnott, although he had not been in the ranks of county engineers for more than three or four years, as a great acquisition, because he believed that previously Mr. Sinnott had a large experience in docks and railway work, and he brought to the subject of road maintenance originality of thought. There was no doubt that lateral movement was one of the greatest drawbacks to the maintenance of good roads. They had to meet it, and he was sorry to say that cases arose where they could not meet it at the right moment. In Middlesex he had a case in which it was his duty to put in a kind of carriageway—it was previously an ordinary water-bound macadam road—and unfortunately before they could put in the kerbs the motor-bus services, within six months, cut the road all to pieces, and before they had time to put in supports for lateral movement they had to resurface the road, and put in a temporary support for transverse movement. Now they were laying a 12-in. by 6-in. kerb on a wall of concrete to withstand the outer pressure on that road from the traffic going over it. He happened to see the box which Mr. Sinnott had referred to lying by the side of the road, and although Mr. Sinnott had had a good deal of practice it seemed to him it was like getting a steam hammer to kill a gnat. It seemed to him that the prevention of lateral movement could be carried out at much less cost than by boxes of that kind. As to cutting into roads for laying down and repairing gas and water and other pipes, he was glad to say the Middlesex County Council had a Bill before Parliament—it had passed the House of Commons, and was now going before the House of Lords—in connection with the new arterial road they had to construct, and in that Bill they had a clause to take powers to prevent anybody from interfering with the carriageway at all after it was completed. No movement in connection with the road surface other than resurfacing would ever be allowed on that road. The Parliamentary agents were asked to draft a clause which absolutely prevented any interference by any outside authorities. All sewers, water mains, gas mains, electrical cables, and everything for the use of the residents living on that road would be laid in the footpaths. They were giving them a width of 15 ft. in the footpaths for their work. Everything in the way of gas and water mains and other services would be duplicated on each side of the road. He hoped the Lords would see eye to eye with the Commons on such an important matter. Referring once more to the question of movement, the point as to moisture in the subsoil was put forward as one of the difficulties they had to contend with. He felt inclined to agree. He had a provincial county under his control for some years. He saw Mr. Parker, of Hereford, present, and he had to meet the same trouble as they had in the county, and he would agree with him that moisture and clay were the chief factors they had to meet in transverse movement. They had got it to deal with in towns; but they had more money at their disposal, and could take better and quicker means to prevent it. Also another point was raised by Mr. Thomas as to the laying of large pitchers alongside country roads to prevent this lateral movement. They had all seen Telford's method of road construction. They had seen the large blocks laid in the centre, diminishing in size at the sides of the road. He did not know whether modern practice was going to reverse that. With regard to Mr. Hawkins' paper, he would like to say that county surveyors were not, as somebody said, wishful to boss the show. County surveyors were serving the public and the ratepayers just as the urban and city men were, and they had only one interest to serve, and that was the purse of the ratepayer, and they looked after that as well as they could. They had a very interesting paper from Mr. Wood, of Fulham. On the question of wood paving he could not quite follow his remarks about a cost of 6d. per yard being the denominator to follow as to the introduction of wood paving. Mr. Wood said that any road costing 6d. per yard in macadam was a road upon which they could lay wood paving with advantage. Probably Mr. Wood did not include payments of interest and repayment of principal of loans; he supposed he must have been referring simply to maintenance. No man could lay wood paving and pay off the debt for 6d. per yard. It worked out in Middlesex—and in the last ten years they had laid 100 or 200 acres of wood paving—at a cost of 1s. 7d. per yard per annum, plus 2½d. or 3d. per yard for maintenance. Another remark was as to bituminous roads costing 4s. 6d. per yard and lasting ten years. He only wished he could get such roads in Middlesex. He should like to get a bituminous road to last five years for 4s. 6d., or even 5s. He was glad to hear Mr. Hadfield and Mr. Gullan both promise to let them have further information of the work they were doing in connection with bituminous roads. Mr. Harpur, of Cardiff, made a rather apt remark when he said he would like to have a line of demarcation fixed between bituminous and water-bound roads. With regard to the tar-painting and spraying of macadam roads, he thought the meeting was labouring under a wrong impression as to the cost of such work to Mr. Matthew Jones, of Chester, and Mr. Webb, who said his tar-painting was costing 2¼d. He thought the difference in cost arose in this way—in one case the work was done by a mechanical spreader, and in the other by hand labour. In Middlesex Mr. Webb's work was done by hand labour. As to tar-spraying, he remembered that in 1906 he brought up a paper to the institution on tar-spraying and painting, and at that time the question was looked upon askance by members of the institution. He was glad to see those gentlemen had lived long enough to see there was some advantage in tar-spraying, and that some good had come from the practice of tar-painting of the roads in all directions in the kingdom.

This concluded the business of the Roads Section.

(To be continued.)

Automatic Street Lighting System for Troon.—A report of the burgh surveyor on the street lighting was considered at a recent special meeting of Troon Town Council, and it was agreed that automatic lighting should be adopted. Subsequently four tenders for a complete installation of automatic street lighting were opened, and it was agreed that that of Messrs. Alder & Mackay, Edinburgh, amounting to £662 10s., should be accepted.

Coast Sand Dunes, Sand Spits and Sand Wastes. By Gerald O. Case. 5s. nett. London: St. Bride's Press, 24 Bride-lane, E.C.—This work is a treatise on the advantages of the proper utilisation of inblown sand, so as to turn it into a protection against coast erosion, instead of being, as too often at present, an active agent in such erosion and in the laying waste of fertile land. The author draws many of his examples from Scotland. He points out the work that has been done on the Continent in turning sand wastes into pine forests. The book gives an able and systematic treatment of its subject.—*Scotsman.*

Law Notes.

Edited by J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be quoted. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction, i.e., without re-drawing or amendment. Unless the questions are complied with, no attempt can be made to reply to queries.

WATER SUPPLY: FREE SUPPLY COVENANT.—A [illegible] Divisional Court, Mr. Justice Neville [illegible] a piece of land [illegible] the purposes of a [illegible] and covenanted to [illegible] necessary pipes for a sufficient supply of water to the farm buildings, and to supply a [illegible] quantity of water for the use of the house free of charge. The house was after [illegible] and part of the farm buildings [illegible] the remainder being let [illegible] on the premises. Difficulties and disputes had arisen as to whether the defendant was now entitled to any, and, if any, how much water free of charge. The council contended that the defendant had so changed the character of the house and enlarged its identity that he was not entitled to a free supply for any purpose whatever, and that in any event he was not entitled to use water supplied free to the farm buildings for the purpose of washing his motor cars. Mr. Justice Neville held that the obligation to supply water free to the house was discharged, the building having been so altered and enlarged that it had ceased to be the house subject existed at the date of the covenant. As regard to the farm buildings, however, he held that they remained substantially unaltered, and that the obligation to supply them was still subsisting, but that the water so supplied must not be used for the purpose of motor cars.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

BREACH OF BY-LAWS. "YDAS" writes: A wooden bicycle shed has been erected in the wharf opposite offices in this town without those carrying out the work first giving notice of their intention to do so, and without submitting plans thereof to my council, as required by Article 92 of the Building By-laws (Model series) in force in the district. The building in its present position is not exempt from the operation of the by-laws, as it is within 8 ft. of the highway and within 30 ft. from the nearest building, and from the boundary of adjoining lands or premises—*vide* Article 2 (*c*). The owners have subsequently slated the roof and sides of the building, but it still contravenes by-laws 11 and 20, which require the walls to be built of incombustible substance. The owners have been asked (*a*) for any explanation they have to offer for their failure to comply with the requirements of the by-laws, and (*b*) to pull down the building, which notice was signed by me, and not by the clerk, as provided by Article 99. But before asking my council for instructions to serve a statutory notice upon the company requiring them to show cause why the building should not be pulled down, or that a summons so as to enforce compliance with the terms thereof be issued, I shall be extremely obliged for your advice on the following: (1) Whether the proper procedure is to prosecute the owners for contravention of the by-laws in neglecting to deposit plans, &c., under the provision of By-law 92; or (2) to proceed under the provision of By-law 99, whereby it would be necessary to give the owners notice to show reason why the building shall not be pulled down, &c., which notice, it appears, must be signed by the clerk; (3) whether forms of notices applicable to the case in question can be obtained from the Government printers or elsewhere; (4) and whether, inasmuch as the slate company's offices and wharf (whereon the shed has been built) are on land in their occupation, which, together with the harbour and several other wharves, were constructed under a private Act of Parliament obtained by the predecessor of the present owner of the estate, the building would be exempt under Clause (*d*) of exempted building included in the by-laws which enacts as follows: "Any building (not being a dwelling-house) belonging to any person or body of persons authorised by virtue of any Act of Parliament to navigate on or use any river, canal, dock, harbour or basin, or to demand any tolls or dues in respect of the navigation of such river or canal, or the use of such dock, harbour or basin, and used or intended to be used exclusively under the provisions of such Act of Parliament for the purposes of such river, canal, dock, harbour or basin"? The offices and wharf are leased to the company by the estate, who obtained the Act of Parliament referred to, and who are the harbour authorities; but the building in question does not belong to the harbour authorities, neither are the owners of the building empowered to demand any tolls or dues in respect of the navigation of the river, &c.

1 and 2. In my opinion the more effectual remedy is to proceed under By-law 99. The notice should be signed by the clerk. 3. I cannot say. Inquiry should be made at the printers. 4. In order to bring the building within the exemption it must (*a*) belong to the harbour authorities, and (*b*) be used exclusively under the Act for the purposes of the river, &c. Unless therefore it is used exclusively for the purposes of the river, &c., it is not exempt. But if it is used exclusively for those purposes, and belongs to the harbour authorities, it is exempt. If the harbour authorities are the freeholders, and if the building is attached to the freehold, it may belong to them within the meaning of the by-law, although the site is leased to the company.

HIGHWAY: WELL COVER.—"Cornwall" writes: There is a public house here which has its front built right up to the edge of the road, and is supplied with water pumped from a well sunk underneath the carriageway. The well has a diameter of 6 ft., and the centre of this is 7 ft. from the front of the house, and out in the carriageway. The covering is granite cover-stones, let down flush with the road surface. There is a lot of traction traffic on this road, and just at this point the road is very narrow, and the traffic crosses the cover-stones and is damaging them; in fact the spot is looking dangerous, owing to the well showing signs of caving in. Will you kindly advise me what action to take in this matter, as I, being the district surveyor, am responsible for the road?

If the highway was dedicated, subject to the existence of the well, I do not think the owner of the public house would be liable to repair the coverstones. See *Robbins* v. *Jones* (9 L.T., 525), *Hamilton* v. *St. Germans, Hanscomparte* (29 L.T., 428). Sec. 83 of the Towns Improvement Clauses Act, 1847, provides for the repair of dangerous places *near* a street at the expense of the owner; and sec. 30 of the Public Health Acts Amendment Act, 1907, provides for the repair, protection, or inclosure at the owner's expense of dangerous structures, wells, &c., in any situation fronting, adjoining, or abutting on a street. The former enactment applies to urban districts, and may be put in force in rural districts by order of the Local Government Board. The latter enactment applies to districts in which it has been put in force by an order of the same board. But neither of these sections appears to apply to the case of a dangerous place actually on the highway. Assuming that this highway is repairable by the inhabitants at large, and that it was dedicated subject to the existence of the well, I think the coverstones should be repaired by the highway authority.

DAMAGE TO LAMP-POST. "ALEX" writes: A motor [illegible] while turning a sharp corner, accidentally had its steering gear broken, with the result that the driver lost control, knocked down and completely broke a lamp-post. Could I recover for the damage done to the lamp-post? The council are not the gas under-[illegible] but is supplied to the council by a private company, but the council are the owners of the lamp-posts and fittings.

If the accident was due to negligence the council could, I think, recover the damage.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

Some Practical Points on Modern Road Work.*

By W. H. MAXWELL, ASSOC.M.INST.C.E., Borough and Water Engineer, Tunbridge Wells.

In the planning of new routes, directness of line is usually an important feature to be considered, from an engineering and utilitarian point of view, but leads to monotony in the use of the road, and does not assimilate sympathetically with the characteristic winding roads of rural England.

As a general rule, it will be more advantageous to carry a new through route past the outskirts of a town, and connect up with some good branch road to the urban area, rather than attempt to carry the new main thoroughfare through the heart of a populated district, as the difficulties and costs of widening existing narrow roads through built-up areas are necessarily excessive, owing to the property and business interests disturbed. Very wide roads are not favoured by shopkeepers, as they are not conducive to good trade, the bulk of pedestrian traffic usually keeping to one side of such a road.

Curves, in a new main road should, of course, be as easy as circumstances will permit, but a radius of 100 ft. should be the minimum where fast through traffic is to be accommodated. On this curve, a person travelling along the centre line of a clear 90-ft. roadway could see approaching traffic within the limits of the road-width about 120 ft. ahead. Under similar conditions, with a 150-ft. curve, a distance of about 150 ft. ahead could be seen. On rural roads, traffic invariably uses the centre of the road by preference, and modern high speeds require an ample, unobstructed view essential.

The easing of curves invariably quickens the speed and reduces that degree of commendable caution in drivers which formerly existed. On a sharp curve the motorist is bound materially to reduce his speed or perish.

Curves should in all cases be freed from side-sight-blocking obstructions, and for increased safety to cut traffic the road surface on the outside curve should be given a suitable degree of super-elevation.

On a part of the Holyhead road on the north side of the city of Coventry, Telford adopted a ruling or maximum longitudinal gradient of 1 in 35. Such a modern gradient will present no impediment to fast driving, either uphill or down, and is one on which tar-macadam and all modern methods of surfacing may be used with safety, but in hilly country will be difficult to maintain, except by much contouring and consequent increased length of route, or by heavy cutting and bridge work.

Dead-level roads are to be avoided. If the longitudinal inclination is less than about 1 in 100, the surface water will be difficult to drain away, and some cross-camber must be provided. With a longitudinal gradient of 1 in 50, or sharper, the camber may be flattened considerably, as the needful surface drainage is obtained longitudinally. This flattening of cross-section should not, however, be carried too far, otherwise watercourses will speedily form down the centre of the roadway on steep gradients.

Suitable cambers for different surfaces under ordinary conditions are: Granite macadam, 1 in 25; tar-macadam, 1 in 30, or 1 in 40 on incline; creosoted deal paving, 1 in 36; hard wood and granite, 1 in 45; and asphalt paving, 1 in 50. The longitudinal fall of water channels should not be less than 1 in 100 for a granite channel, and 1 in 150 for asphalt.

IMPROVEMENT OF EXISTING ROADS.

Inadequate Foundations.—The majority of the old highways of this country have come into existence in a more or less haphazard fashion, and in the past the provision made for their maintenance has been uncertain and inadequate. The entire absence of foundations suitable for carrying modern weights brought upon the surface is revealed by the upward movement of the sides of the roadway into the channels—a weakness to be observed generally throughout the country.

Vast sums are now being spent in laying down expensive so-called waterproof surface crusts of various kinds, in order to give an immediate show for the money expended, but the writer is of opinion that wherever there is evidence of underlying weakness money may be more advantageously applied by first putting in proper foundations and drainage. However excellent, well laid or expensive may be the surfacing material, it can never prove really satisfactory on a weak foundation. There will be gradual but constant movement of the road crust, local sinkages of the central portion and rising of the sides, and generally the annual expense of wear and tear of the surface will be greatly enhanced in cases where no solid and unyielding foundation exists.

The initial cost of such work is, of course, necessarily heavy, but where suitable foundations do not already exist it is submitted that it is the only sound course to pursue, both from an engineering and financial point of view, and is essentially a capital work for which State grants on liberal terms should be made.

Thin Crusts.—The wisdom of recent practice in laying thin surface wearing crusts or armourings of asphalt and bituminous preparations over existing macadam surfaces is open to great question, except where an absolutely rigid and dry foundation can be relied upon. In the absence of this, most ordinary road surfaces are subjected to considerable movement under modern speeds and weights, and in these circumstances thin wearing crusts are liable to fracture and disintegrate. Great caution in the selection of a suitable site is necessary, except where laid on a good concrete foundation, which, unfortunately, in most cases, would make the cost of the work prohibitive.

Bituminous Methods.—In what are now known under the general name of "bituminous methods" the presence of coal-tar and pitch is the distinguishing feature, and the main object of all such processes is to exclude water from the crust of the road. These methods consist mainly in the revival and extended use of tar-macadam, pitch-grouting, tar-binders, and other like forms, and in suitable situations and conditions give very serviceable surfaces at a not unreasonable cost, but much discrimination is needed in their application.

The arch enemy of the tar-macadam road is the traction engine, and this cumbersome, vexatious contrivance is, unfortunately, rather in evidence in the writer's district, especially during the spring and early summer months. These engines, with destructive diagonal steel strips on the wheels, weigh over 16 tons on the road, and haul three lumbering wagons weighing about 12 tons each when loaded. Under this burden the very best of tar-macadam work suffers substantial damage. Even after having been laid many months the material, owing to its plastic nature, will slightly soften on a hot day, sufficient to permit of its being crushed out of shape and torn up under traffic of the class named.

A well-made granite macadam road surface withstands this class of traffic very much better than tar-macadam, or any of the bituminous processes.

To the enthusiast for tar-macadam, in addition to the above caution, the writer suggests that consideration of the following points will help to keep him out of trouble:—

(1) The quality of tar available for such work is very variable and unreliable, and requires constant watching to avoid failure.

(2) Good, fine weather is an important factor for successful work. If the weather is too cold there is great risk of too much tar being used, thus causing the tar-macadam to become very soft and easily damaged during the warm weather.

(3) Tar-macadam is hopeless on a weak, yielding foundation.

(4) It cannot be satisfactorily repaired during wet, cold weather. This is important in streets where much opening of trenches for gas, water, electric and other services is likely to be required.

(5) Where there is much traffic a continual watch must be kept on the work for some time after it has been completed, which considerably adds to its cost.

(6) Tar-macadam is liable to "creep" during hot weather towards the sides of the roads, especially in country districts, where the lateral support of a kerb and footpath is not usually available, and some provision to meet this tendency should be made.

(7) The cost of tar-macadam is, as a rule, much

* Paper read at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham.

[illegible] successful work.

With regard to the distinguishing of tar-macadam [illegible] work is expensive, its serviceable life is not great, the surface [illegible] much slippery mud during wet weather.

[illegible] rial at the bottom, and finished with a fine grade for the surface. A coating of the thickness named is best laid in two layers, but there is no advantage in separating the fine and coarse grades; the same mixed grade material should be used for both coats.

Rolling of tar-macadam is best done with a light steam roller (6 or 7 tons weight), and there is nothing [illegible] excessive amount of rolling.

Tar-macadam may be laid on gradients as steep as [illegible] if the surface is kept clean. The degree of slipperiness experienced depends greatly on the weather and the skill of the driver.

It is a great mistake to lay tar-macadam or any other bituminous road surface over an existing macadam roadway as a foundation without first lightly scarifying the surface all over and consolidating by rolling to a uniform condition before the bituminous material is laid. Where this precaution has been neglected the old inequalities and potholes in the road crust will soon reappear on the surface of the newly laid coat, as the greater depth of bituminous material over the pothole consolidates more than the thinner coating around.

Tar and Tar-paving.—Experience of recent years has led to the settling down of much preliminary clamour about dust-layers to the very general use of coal-tar. This new demand has brought about a very substantial increase in the price of tar, and, with the continued extension of bituminous methods of road construction, the demand appears likely to exceed the supply, and so set a limit on this form of road improvement unless competitive processes are adopted.

The specially prepared tar for road surface painting used by the writer weighs 12·6 lb. per gallon, or 173 gallons to the ton. This is heavier than the weights recommended in the Road Board Specifications, but the tar is found to make very satisfactory work.

Tar-painting is not usually very successful on roads with damp, clayey subsoils, in shady situations, or under trees. A dry, sandy or chalky subsoil is the most favourable for the work, and in these areas operations can be started earlier in the season.

The heavy, complicated, costly tarring machines of early tar-painting days have almost disappeared in favour of much simpler plant and hand work, the latter giving the best results in this class of work.

For town work granite chippings ⅜-in. to ⅛-in. gauge make the best class of grit for covering the tar. Sand, though usually much cheaper, produces an increased quantity of mud and causes the tar-painting to tear up more readily under heavy traffic.

Shopkeepers—such as greengrocers, butchers and fishmongers—who expose their goods in the open do not usually appreciate the tar-painted road, and some light watering is occasionally necessary to cope with dust blown on to the tarred surface.

Increased attention is necessary on a tarred road to the picking up of horse-droppings and light litter, as these blow about much more readily than on an ordinary macadam road. The writer uses a number of light covered hand-barrows for this purpose on all tarred areas.

In his experience the amount of money spent on road tarring is about equivalent to the saving obtained in ordinary maintenance and wear and tear on the roadways, so that no increase on the total cost of highways arises, while a greatly improved surface is obtained during the summer and autumn months. Tar-painting gives most economical results on secondary roads, culs-de-sac, and other thoroughfares with light traffic, as, in some cases, the tarred surface remains in good condition for several years without repair, and very little attention of any kind is needed.

Repairs.—Systematic inspection of the roadways, and regular and prompt patching or repairs are [illegible] roller of the convertible tractor type, which is well adapted for this purpose.

[illegible] quire to be regularly patrolled and repaired, much in the same way as a railway track.

Old screened road metal of small gauge is well suited for patching, as it consolidates quickly.

Ordinary macadam surfaces should not be patched with tar-macadam, as, after a little wear, a most unsightly and intolerably bumpy surface results, owing to want of uniformity in wear of the variegated surfaces.

When recoating a roadway the thoroughfare should be closed wherever possible, and the whole width of road coated and rolled in one operation. Work of this class done in half widths is seldom satisfactory, as rapid wear invariably occurs at the central joint. In cases where this system cannot be avoided it is best, if possible, to first treat about two-thirds of the width, so as to keep the joint out of the centre of the road; but many roadways are too narrow to permit of this being done.

Weather conditions are among the most powerful factors influencing the wear and tear and deterioration of roads. Prolonged rain and heavy traffic following the break-up of frost immediately succeeding a wet period are particularly destructive.

In town streets where a macadam surface has to be renewed about every two years and patched frequently, a wood-paved surface will probably be more advantageous. A maintenance cost of 10d. per square yard per annum is about the economical limit for macadam, and, from the point of view of traffic weight, a load of some 250 tons per yard of width per day is about the maximum for an ordinary macadam surface.

Steam Rollers.—In the opinion of the writer the usual so-called "10-ton" steam roller is much too heavy for the majority of surface recoating work. These rollers, when loaded ready for the road, often weigh nearer 13 to 14 tons than 10, and frequently cause much damage to the new metalling by crushing and weakening it during the process of consolidation. In some cases metal is put on the hard crust of the old road without preliminary scarifying, and rolled down with a heavy steam roller, with the result that the stone, being severely crushed between hard surfaces, is permanently damaged at the outset, and the serviceable life of the new coat thus sadly reduced.

For much of this work the writer uses what is described by the makers as a 7-ton roller of the convertible roller-tractor type already referred to. This machine is found to be of the greatest service for all classes of work as well as for haulage. The small tractor roller can be moved quickly from job to job, and can be converted to a tractor in about a couple of hours. The cost of a first-class machine of this kind, including both roller and tractor gear, would be about £550. This roller, with awning, water, &c., fitted up ready for work on the roads, actually weighs [illegible]

MECHANICAL HAULAGE FOR MUNICIPAL WORK.

Whatever may be the views held as to the desirability of public highway authorities employing steam, petrol, or other motor vehicles for haulage purposes, the writer has been practically compelled to do so on account of the difficulty experienced during the busy spring and summer seasons in procuring sufficient suitable horses. It is usually impracticable to keep, during the relatively quieter winter months, a full stud of horses sufficient to cope with all work during the busier period of the year, and such work as street watering and road tar-painting greatly accentuates the variation between winter and summer haulage demands. The hiring of the surplus summer requirements affords one way out where the horses can be got; but horse contractors are fast changing to mechanical haulage, thus greatly limiting the supply.

SLIPPERY ROAD SURFACES.

In these days of improved road surfaces, tar-painting, tar-macadam and such like, complaints are, perhaps, a little more frequent in respect of slipperiness, and requests for gritting or sanding are often made. The best plan to overcome slipperiness is to keep the surface as clean as possible by removing (and washing off, if necessary) stiff, pasty mud which is liable to accumulate during the foggy, damp weather of the winter months. Gritting and sanding greatly increases

the production of this stiff, slippery mud, as the surface is speedily crushed by the traffic. The mud [illegible] of grit, therefore, should be done as sparingly as possible, and scarcely if the surface should take place.

ROAD SIGNS.

Generally speaking, there is room for improvement in road direction signs. Frequently they are so [illegible] that an approaching traveller cannot read the [illegible] and even some lines distinctly. [illegible] should be at the most favourable angle, the letters not less than 3 in. in depth, and the mileage stated in bold block figures to the nearest quarter. Strangers motoring long distances [illegible] impossible to quickly gather the name of the place they are passing through, and it would be a great convenience to have the name of the village or town boldly erected on the through roads near the commencement of the village buildings.

Signboards and posts are costly to erect and maintain, and the moving reflected image is liable to mislead a motorist unaccustomed to them.

It is a mistake to multiply danger and caution [illegible] They should be confined to the most awkward spots and be erected by a public authority. No private signs should appear on a public highway. If too numerous the familiarity of their [illegible] leads to a general neglect of the warning intended to be conveyed.

CONDUCT OF TRAFFIC ON ROADS.

The education of the general public as to the altered conditions of use of roadways has not kept pace with the development of fast mechanical traffic. The change has been great, and the highways must henceforth be looked upon as lines of communication much in the same way as railways are regarded. Street accidents to pedestrians mostly arise from lack of caution and alertness in crossing, hesitation when halfway across the road, children playing in the road, and neglect of keeping to the "rules of the road."

MOTOR-OMNIBUS TRAFFIC.

There is no doubt that heavy motor-omnibus traffic on roadways is most destructive, and, in some cases, has more than doubled the cost of maintenance. In the writer's district motor omnibuses run frequently between practically all the principal outlying villages, and shortly after a new route has been started a marked increase of wear and tear of the road is apparent, especially in the number of potholes produced, for the creation of which heavy and fast traffic of the motor omnibus type seems to be peculiarly adapted.

Protective clauses in recent private Bills of promoting companies have been accepted by Parliament, empowering the road authorities concerned to recover from the motor-omnibus companies ¾d. per car-mile; but this contribution is inadequate to meet the increased cost of maintenance in some cases.

The tendency of motor-omnibus traffic travelling to and fro over a defined route is to keep to fixed grooves or tracks formed in the road surface, and thus produce longitudinal channels or wheel tracks, which spoil the contour and drainage of the road surface.

The degree of damage done depends upon the class of tyres used, the diameter of the wheels, the width of the rims, the balancing of the vehicle, the proper suspension of the weight of the vehicle by suitable springs, the relation between propelling power and weight, the action of the brakes, and other factors.

STATISTICS OF TRAFFIC.

The [illegible] of traffic recorded in the particular width of roadway does not in many cases give a true representation of the amount of wear and tear over a roadway. On roads through rural districts with [illegible] amount of traffic a very large percentage of vehicles keep to the centre of the road—in fact, the less the volume of traffic the higher will be the proportion using the centre of the roadway. Thus the sides suffer but little wear, while the centres soon become worn out. The average traffic record per yard-width does not therefore correctly show the conditions which obtain, and a minimum and maximum record is necessary to [illegible] the true facts.

Much the same thing often occurs on very wide roads, as a particular portion of the roadway is used by a high percentage of the traffic.

On busy town roads of medium width the traffic is very fairly distributed, and it is mainly to this [illegible] that the average tonnage per yard has any reliable significance.

On some roads, owing to the nature of local industries, the night traffic is quite an important item, and should not be omitted if a true record of actual conditions is to be obtained.

COLLECTION OF INFORMATION, STATISTICS, ETC.

The collection of information and statistics, in reference to roads, traffic, materials, and other like matters, is a useful occupation from many points of view so far as it goes, but the road engineer should be cautious as to the conclusions he may safely draw from the collected data placed before him. So much depends on the actual conditions in any given case, and it does not by any means follow that because a road material has proved satisfactory or otherwise in one place it will necessarily do so in another. A new set of conditions will produce its own set of results, and the engineer must use his judgment in each case according to his local knowledge and experience.

EXPERIMENTS AND TESTS.

Laboratory and other indoor tests of road materials serve a useful purpose in arriving at the physical and chemical properties of the materials, and assist the engineer when the information so derived is seasoned and matured by practical experience on the road. Weather and traffic are of paramount importance in all road-making matters, and there is no test to be relied upon other than that of actual and adequate trial on the road under ordinary conditions of traffic, rain, frost, and numerous other disturbing influences to which any road material must necessarily be subjected.

CLASSIFICATION OF ROADS.

The existing division of roads into "main roads" and "other roads" can scarcely be considered satisfactory owing to the varying policy adopted in different counties in regard to the "maining" of roadways, and a proper classification on a uniform basis is desirable. Since the Local Government Act of 1888 the introduction of motor traffic has greatly altered the conditions in regard to the "through" use of the roads, is responsible for the heavy increasing burden of maintenance, and for the need of reorganising the sources from which a large proportion of the cost is derived.

ADMINISTRATION OF HIGHWAY MAINTENANCE.

Good administration, particularly in reference to the disposition of labour, materials, and plant, is one of the leading factors in highway maintenance essential to efficient and economical work. In urban areas suitably placed central depots, with railway sidings into which materials can be delivered direct, are a great convenience, and involve the minimum haulage of materials. In these days of frequent labour disturbances, as in the case of the railway, dock, and colliery strikes, the necessity of getting all materials on the spot well in advance of requirements has been greatly emphasised, in order that annoying delays may be avoided. Delay in any form means increased cost of the work in hand, frequently entails loss of good weather suitable for the work, and always gives regrettable inconvenience to the general public.

Wherever much work is in progress, constant inspection and supervision is a good investment, and to this end the inspecting staff should be provided with appropriate means of quick and convenient [illegible]

Local materials should be employed wherever of suitable quality, but some counties—*e.g.*, Kent—are particularly deficient in good quality stone suitable for first-class roads carrying considerable traffic.

Over "centralisation" of the practical work of road maintenance is not desirable. It is apt to lead to so-called "red-tape" methods, costly delays, and lack of individual attention.

Road maintenance should be carried out through the responsible highway authorities by the direct employment of labour, thus ensuring a local interest in the work, close supervision, and prompt attention, which is almost impracticable under any too distant and highly centralised system of administration.

Stereotyped standardised methods in many matters connected with road making and maintenance are to be deprecated. Such methods destroy the useful application of personal experience and judgment to individual cases, and so lead to mere routine and lack of interest. It is unlikely that there can be any universal solution of the road problem, inasmuch as local conditions and requirements, character and

extent of the traffic, and from the point of obtaining an even surface, considerations of cost and the distance over which the materials are carried, the decision ever to be decided upon is arrived at the most suitable and satisfactory mode of procedure in each particular case.

ROAD MAINTENANCE AND REPAIR IN NORTHAMPTONSHIRE.

By CHARLES S. MORRIS,
County Surveyor.

The time is rapidly approaching when the present system of road maintenance in Northamptonshire, namely, short lengths on every road each year—will have to be discontinued and a new system adopted of recoating each road from end to end as and when required. This does not necessarily mean any great increase in the total cost of maintenance—on the contrary, it will probably be cheaper—but simply that the bulk of the materials will be concentrated upon certain roads each year instead of being spread over the whole mileage as at present.

To some extent this policy has already been adopted as the council have in hand the entire resurfacing of the London Holyhead and other important roads, and it appears to me that the traffic of the present day will ere long demand the adoption of the principle to the whole of the main roads. Certain small surface repairs will doubtless from time to time be necessary to the roads so treated, but it is obvious that roads recoated throughout in any one year will at a given period again require resurfacing throughout, and cannot be dealt with in sections as at present. From a traffic point of view there is a distinct advantage in having the whole work of renewal of each road carried out in a given year, with no further obstruction by road repair operations for several subsequent years, in addition to the truer and continuous surface which can be obtained and maintained by this method.

EXISTING DIFFICULTIES.

With the present method it is a most difficult matter to make a satisfactory joint at the ends of each "Tarvated" coating, which has to be tapered off, and even when this is carefully done the more rapid wear of the older water-bound portion soon produces a "step," which is most unpleasant to drive over, and gets more pronounced every day. Patching is of little use, as, unless a bituminous material is used, it is soon worn away, and the application of such material very soon results in the same effect. This applies also to patching water-bound roads with Tarvia or tar-macadam; even when the work is most carefully done and made perfectly level with the surface, in a very short time the greater rate of wear of the older water-bound portion causes the patches to stand up in a series of humps which are nearly as unpleasant to drive over as the holes they have replaced. Patching with ordinary metal is useless, except during very wet weather, as the fast traffic simply throws the metal out of the holes all over the road, where it is ground to dust by the heavier vehicles.

All these difficulties in retaining a true and even surface tend to show the necessity for adopting some form of bituminous or other binder which cannot be easily displaced by fast traffic, and which can be readily and satisfactorily repaired when damaged. The volume, weight, and speed of the traffic on the main roads is undergoing a remarkable change, and we are now faced with the fact that the majority of the existing water-bound roads are totally inadequate to carry the ever-increasing motor traffic. The advent of heavy motors and tractors sorely tried the roads, but the addition of motor bus services has proved the "last straw." Many of the roads, which a year or two ago were in a very good condition, have been almost ruined by the passage of these vehicles, and there is apparently no option but to reconstruct them with a bituminous binder. The work of reconstructing and widening about 50 miles of the principal roads is now in hand, but I notice that many other of the main roads are showing evidence of considerable damage, and the council must ere long be prepared to meet a large expenditure on these roads. It is a "penny wise" policy to allow a road to be practically destroyed before carrying out the repair or reconstruction of it, as the longer the work is delayed the more costly it will be. It is far cheaper to recoat a slightly damaged road than to reshape and repair it after it has been in a large extent destroyed.

RECONSTRUCTION SCHEME.

Many county councils have submitted to the Road Board schemes for the reconstruction of their principal main roads, and although Northamptonshire has also down on its some 50 miles, the time is rapidly approaching when a further scheme will be necessary for the widening and resurfacing of a considerable portion of the remainder. Apart from the financial side of the question, towards which the Road Board will no doubt give substantial help, the greatest difficulty will be to obtain a sufficient supply of materials, as the granite quarries from whom our present supplies are obtained have in almost every case more orders than they can deal with, and to go farther afield for materials will mean a large addition to the cost of the work. This difficulty, however, will probably be overcome, providing sufficient notice is given of our requirements, as many of the quarry owners would put down additional machinery if the demand for road material warranted it. The work of reconstructing a large mileage of roads cannot be taken in hand at a few weeks', or even months', notice, as there is an enormous number of details to arrange before the work can be commenced, and the work cannot be efficiently and economically carried out unless sufficient material is obtained in advance to keep the men and steam rollers fully employed. I therefore propose to submit such a scheme to the Roads and Bridges Committee during the current year in order that we may not be faced with the difficulty of having to deal with this matter at short notice, or when the roads have been so damaged as to entail a very large expenditure to restore them.

The total cost of the whole of the works on the county main roads . . . amounts to £131·07 per mile, and the nett cost to the council £91·26 per mile. The estimated expenditure for the current year is £5,582 gross and £33,660 nett, or £175·64 and £105·89 per mile respectively.

Waterproofing of Cement. In the new municipal swimming baths which are being erected in Salisbury, Rhodesia, the cement waterproofing powder Pudlo has been specified.

Proposed Walsall Improvements.—The Walsall Corporation Bill, which seeks powers with regard to tramways, trolley vehicles, motor omnibuses, street improvement, and the construction of a new street, and to make further provision in connection with the local gas and electricity undertakings, was, on Monday, ordered for report and third reading by a Committee of the House of Lords.

A Glossary of Road Terms. By H. Percy Boulnois. MINSTER: St Bride Press, Limited, 24 Bride-lane Fleet-street, E.C. Price 2s. Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he had made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before. *Portsmouth Times.*

Berkshire Roads.—In his ninth annual report, Mr. J. Fred. Hawkins, county surveyor of Berkshire, again draws attention to the damage caused to the surface of the roads in the county, especially in the North District, by traction haulage and carting from the fields on to the roads during wet weather and after slight frosts, no attempt being made by the carters to scrape the mud from the wheels. Mr. Hawkins points out that if more consideration were shown the surface would not be licked up and that there would be a saving in the cost of repairs, as these lengths would require sheeting less often. It appears from the report that the Newbury, Ilsley, Abingdon, and Oxford road is fast becoming one of the most important roads in the county. Originally, practically only a sheep track, it has now become the main trunk road from Southampton to the North, and will at an early date require reconstruction. "This expense," the county surveyor observes, "would certainly be beyond the finances of the county, and when such reconstruction is undertaken a large portion should be borne by the Road Board."

The Surveyor

And Municipal and County Engineer.

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CROYDON RELIEF ROAD.

THE SCHEME NOT TO BE ABANDONED.

The scheme for the making of a relief road for Croydon—a by-pass road from Thornton Heath Pond to Purley—is now, in all essentials, again at the stage at which it was before the Local Government Board inquiry, reported in our issues of May 23 and May 30, 1913. The Local Government Board has refused to sanction the loan representing Croydon's initial share in the enterprise, and, without condemning the scheme, takes the view that Croydon's share is too large. The Road Board has now, however, offered to grant an additional sum of £19,000 towards the cost of the road, bringing the board's total contribution up to £49,000. That this additional sum will be expended on additional works not in the original estimates does not alter the fact that Croydon's £20,000 now becomes a somewhat smaller proportion of the whole sum to be spent. On this ground the Croydon Borough Council decided, at a recent meeting, again to ask the Local Government Board to sanction the expenditure.

Essentially, therefore, the position is unaltered, though the additional expenditure on the junction of the relief road and the existing main road at Purley makes the project a better one from the engineering point of view. The Ecclesiastical Commissioners have raised their contribution from £5,000 to £7,000, but it is understood that this is with the stipulation that certain works shall be carried out, the cost of these being estimated at about £1,450. The closing of a bridle road is also made a condition of this offer, and as opposition to this course is to be expected it is probable that the borough council will refuse the offer of the commissioners.

The total cost to the borough must, in the first place, be discounted by the fact that certain works of improvement, estimated at £24,000, would probably be regarded as necessary in any case in the near future, these works being included in the scheme. On the other hand, the responsibility of the borough would not be limited to its contribution to the capital cost. The borough would have to maintain the road and light it, and would also, when and where necessary, have to carry out sewering and the kerbing and channelling of those parts of the road not provided for in the estimates. It is impossible to forecast the probable amounts of Imperial and Road Board contributions towards maintenance, but these might be important. As regards such civic developments as the borough may put in hand, it is difficult to understand the position of those who oppose the scheme on the ground that there may be heavy expenditure in this direction. If the borough develops the road as a street and puts in sewers, it will undoubtedly be because these works are needed, apart from the existence of the road as a thoroughfare. The advocates of the scheme cannot be held responsible for the possibility that the mere existence of the road may induce the borough into unjustified expenditure, which is what the opponents of the project are afraid of, if there be any reason in their objections on this score.

The present estimate is in excess of the cost of the road as a by-pass for through traffic. The proposed width of 40-ft. carriageway is much greater than the widths of the present main road in its narrower stretches, and yet these widths fully suffice for through traffic, as may be proved by observation at times when there is much through traffic but very little local traffic. The congestion is caused by standing vehicles, and partly by cross-traffic when Croydon itself is busy. A 20-ft. road, even if it took three-quarters of the through traffic, would amply suffice for present needs, and there are several places on the route where the saving in cost by adopting a width of 20 ft. or 25 ft. would be much greater than that represented by the reduction in width of the carriageway itself.

From the economic point of view the project is an excellent one if it be regarded as confined to the provision of a road for through traffic, provided with wide footways, which could be made narrower in the future if the amount of traffic became much greater; but, regarded as a civic speculation, the scheme is weak, inasmuch as considerable parts of the route are in land that does not lend itself to building developments of a suitable kind—that is, of a kind that would justify the provision of a main street, kerbed and channelled, and used as a trenching ground for sewers, water pipes, and other conduits. If the Local Government Board were prepared to take the view that the civic speculation is justifiable, the matter could properly be left to the local authority. But this is not now the position, and it seems hardly likely that the board will be impressed by the slight reduction in the proportion of Croydon's initial share of the cost. The attitude of the board suggests, on the contrary, that some other solution would be more acceptable. One solution would be for the Road Board itself to make the road, in which case it might be decided to reduce the scheme to the provision of a relief road only, making no provision for a street with house or shop frontages. The other solution would be for the borough council to adopt a similar policy, in which case, if the Road Board were prepared to maintain its grant at the amount at present offered, Croydon's share in the initial cost would be reduced to a very small sum, or to zero, and the responsibilities of the borough for future works and for maintenance would be also greatly reduced.

Toronto Sewerage Scheme.—The new sewerage system for North Toronto, which the city must construct under the terms of an agreement by which the township of North Toronto was annexed to the city, is estimated to cost more than £800,000. Two systems were considered originally; one contemplates separate sewers for storm overflow and for ordinary purposes, at a cost of more than £1,200,000. The alternative system, which is the one recommended, will have sewers to serve both purposes, at an estimated cost of £828,851. The system is to be in two divisions, one with lateral sewers, trunk sewers, outlets and disposal plants. The sewage from the lateral sewers—144 in number—will flow into thirteen local trunk sewers, extensive enough to provide for the future development of the district. The sewage disposal plant will include tanks for the treatment of storm water and Imhoff tanks for sewage, and the plant will be so built that additions can be made as required without disturbing the general plant. The second division of the system, states the *Contract Record*, will be somewhat similar. There will be 139 lateral sewers, seven local trunk sewers, two storm outlet sewers, and one outlet sewer.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc. M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bridgeland, Fleetstreet, E.C. Those may be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear for the contributions considered to be the most useful, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

Last week answers are invited to the following questions:

405. Disinfection. Sketch and describe a form of [illegible] suitable for use in a town of 50,000 inhabitants.

407. Surveying. Describe a method of setting out curved curves by means of offsets. (M.C.E.)

409. Road Construction.—Give a specification for the conversion of a [illegible] into a granite setted pavement suitable for heavy commercial traffic. (Urban.)

410. Removal of Sand Bar.—A certain stream which discharges into the sea has become silted up, and diverting at its mouth, by the formation of a sand bank 100 yds. by 10 yds. by 3 yds. What steps should be taken to prevent a nuisance, and to insure that the stream will be self-cleansing by the action of the tides? (Steeplus.)

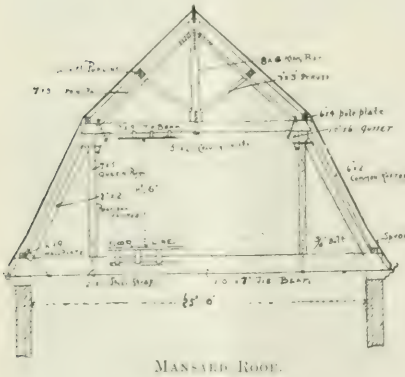
411. Foundations for Chimney Shaft.—What calculations are necessary for finding the width and depth of concrete for the foundation of a square furnace chimney shaft, 150 ft. in height, on a gravel soil, and built in accordance with the London Building Act, 1894? (Student.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

406. Building Construction.—Sketch a mansard roof, showing timbers; also a dormer window in an ordinary roof. (Junior.)

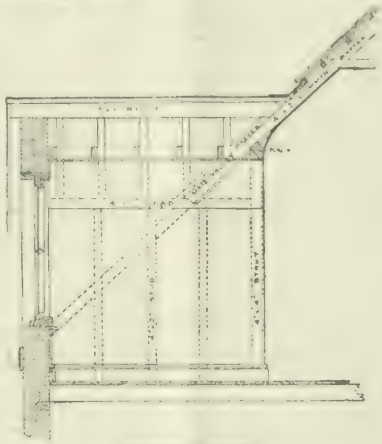
In a mansard roof the king-post truss is placed immediately over the queen-post truss. Sketch shows mansard roof in detail, but the timbers shown in the sketch would be sufficiently strong for a roof of 35-ft. span. The tie beams, queen-posts and



Mansard Roof.

king-post, principals, &c., should be of pitch-pine. The sketch shows two gusset pieces to reduce the stresses upon the fastenings. Mansard roofs are used in large buildings to obtain the maximum amount of cubic space without obstructing light and air. (Sanitas.)

The following sketch shows a dormer window in an ordinary roof:



Dormer Window

ARCHITECTURAL COMPETITION.

AUSTRALIA'S FEDERAL PARLIAMENT HOUSE.

The Australian Government announces an international architectural competition for the purpose of selecting the architect of the Parliament House, and, possibly, incidentally an additional architect for other Government structures of the new Federal capital city, Canberra.

Only tentative outline sketch designs for the building are requested, and eight prizes, aggregating £6,000, are offered, the first being £2,000, in addition to commission for service at the scale of the Royal Institute of British Architects.

The designs may be submitted in either Melbourne or London by the end of March, and will be judged by the following jury of architects, whose decision will be final: Messrs. George T. Poole, of Australia; John J. Burnet, of London; Victor Laloux, of Paris; Otto Wagner, of Vienna; Louis H. Sullivan, of Chicago.

The programme will be issued to any practising architect on application to the High Commissioner for Australia in London or any British Ambassador to whom copies are being forwarded.

International Municipal Conference.—The mayors of some of the most important cities of the United States, together with a number of ladies and gentlemen identified with municipal matters, will arrive in London this week end, and on Monday next will attend the opening of an International Municipal Conference at the Anglo-American Exposition, Great White City, Shepherd's Bush, London, W., with Viscount Peel, the chairman of the London County Council, as president. A number of mayors from various parts of the United Kingdom, and members of city and borough councils, municipal officials, together with a large number of persons interested in municipal self-government, have accepted the invitation sent out by the Earl of Kintore, chairman of the Executive Committee of the Anglo-American Exposition, to attend this conference, and it is hoped that the result of the deliberations will have an important influence upon municipal matters generally. The conference will sit from Monday, the 20th, till Saturday, the 25th, from 10 a.m. to 5 p.m.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Ammanford U.D.C. (July 14th. Mr. P. M. Crosthwaite).—£1,400 for the construction of a stone bridge over the ford at Manit, Pantyffynon. It was stated that the bridge is estimated to cost £3,500, and that contributions had been promised towards it by Carmarthen County Council £1,000, Swansea Rural District Council £300, Llanelly Rural District Council £250, Pontardawe Rural District Council, £250, and the Buckley estate £75.

Darlington T.C. (July 13th. Mr. R. H. Bicknell).—£11,400 for works of private street improvement, £8,372 for resurfacing streets with tar-macadam, and £3,991 for the widening and improvement of Haughton-road.—With respect to the Haughton-road scheme, it was stated that the road was part of the main road from Barnard Castle to Stockton. The North-Eastern Railway Company proposed at an early date to centralise their goods departments on land on the south side of the road, and the result would be that the heaviest traffic in the borough would be diverted on to this road.

Dublin T.C. (July 7th. Mr. P. C. Cowan).—£77,800 for electricity purposes, and £5,000 for the public lighting department in connection with the conversion of gas lighting to electric lighting.—Mr. Allan, secretary of the Electricity Committee, said the period of "speculative extensions" was at an end, and it had been decided, the Board of Trade having given sanction, to try the new system of suspension lighting now becoming so popular in England. This system would, he said, be adopted in narrow streets running off main thoroughfares.

Hull T.C. (July 14th. Mr. Geo. L. Pepler).—This was an inquiry into an application by the town council for authority to prepare a town planning scheme, partly within the city and partly within the rural district of Sculcoates, under the Town Planning Act of 1909.—The deputy clerk, Mr. G. C. Kiss, stated that under a scheme of town planning the corporation hoped to have the power to limit, to a reasonable extent, the number of houses that should be erected on a given unit of land, and so prevent the creation of slums. They hoped to have the power to control the style of construction of buildings, and to decide where offensive trades and factories should be placed. The area with which it was proposed to deal was situated on the north-eastern boundary of the city, containing 913 acres, and was very likely to be developed at an early date.

Llanelly R.D.C. (July 15th. Mr. P. M. Crosthwaite).—£41,258 for sewerage and sewage disposal in Llanelly and Pembrey. Mr. E. J. Silcock, Westminster, the engineer, gave details of the scheme, and Dr. Evan Evans, medical officer of health, testified that the proposed works were necessary in the interests of the public health.

Midhurst R.D.C. (July 13th. Mr. R. G. Hetherington).—£780 for the purchase of land and the erection of four cottages in the parish of Chithurst, under the Housing of the Working Classes Act.—The inspector stated that, according to the board's reckoning, there would be a deficit of £7 3s. "Supposing it is necessary to make the two sides of the balance-sheet tally," he said, "what do you suggest—reduce the cost or increase the rent?" The clerk, Mr. J. M. Furneaux, replied that he thought the council would be inclined to raise the rent to 4s. 3d. or 4s. 6d. They did not want to erect jerry-built cottages. He thought there would be a demand for the cottages at a higher rent. Mr. A. G. Gibbs (surveyor), Dr. S. Child (medical officer), and Mr. S. E. Stratford (sanitary inspector) gave evidence in support of the scheme.

Wellington U.D.C. (July 3rd. Mr. W. O. E. Meade-King).—£2,088 for the erection of new council offices, a fire brigade station, and public conveniences in the centre of the town, on a portion of the land recently occupied by houses which had to be pulled down for the widening of North-street and the town hall corner. Mr. Howard, the architect of the new buildings, gave details of the scheme and presented the plans.

APPLICATIONS FOR LOANS.

Bournemouth T.C. £1,000 for drainage and other works at the cliffs.

Beckenham U.D.C. £2,800 for the extension of the recreation ground.

Chapel-en-le-Frith R.D.C.—£2,000 for works of sewerage.

Croydon T.C.—£19,000 for the council's share of the cost of the proposed relief road from Thornton Heath to Purley.

Cudworth U.D.C. £6,000 for works of sewage disposal.

Harrogate T.C.—£2,177 for private street improvement.

Harwich T.C.—£2,140 for workmen's dwellings.

Heckmondwike U.D.C. £200 for electricity mains.

Horbury U.D.C.—£4,000 for a public hall.

Lisburn U.D.C.—£3,500 for the provision of a technical school.

Loughborough T.C.—£640 for a school clinic.

Richmond (Yorks) R.D.C.—£700 for works of water supply.

Swansea T.C.—£101,990 for the erection of 500 workmen's houses.

Ulverston R.D.C.—£700 for works of sewerage.

Wakefield T.C.—£4,440 for street widening and improvement.

LOANS SANCTIONED.

Bideford R.D.C.—£2,346 for a housing scheme.

Brighton T.C.—£1,500 for alterations to the North-road electricity station.

Edinburgh T.C.—£220,000 for the purposes of the electricity undertaking.

Grantham T.C.—£448 (for thirty years) for cemetery extension.

Halstead U.D.C.—£1,500 for the erection of six workmen's dwellings.

Hampton U.D.C.—£1,150 for the construction of an open-air swimming bath in Bushey Park, to be repaid within twenty years. The work is to be carried out departmentally under the surveyor, Mr. S. H. Chambers.

Littlehampton U.D.C. — £710 for public conveniences.

Lowestoft T.C.—£3,800 for an open space.

Melton Mowbray U.D.C.—£2,150 for the provision of a refuse destructor.

Poole T.C.—£250 for a refreshment pavilion in the public park.

Rochford R.D.C.—£750 for workmen's dwellings.

Swinford (Ireland) R.D.C.—£16,791 for labourers' cottages.

Turton U.D.C. — £8,735 for works of sewage disposal.

Winchcomb R.D.C.—£17,000 for works of water supply.

FORTHCOMING INQUIRIES.

JULY.	£
18. **Friern Barnet.** For street improvement (Mr. R. H. Bicknell)	3,284
20.—**Maidstone.** For the purposes of street improvement and the erection of a hall (Mr. R. H. Bicknell)	1,860
21.—**Burton-upon-Trent.** For the gas undertaking (Mr. H. R. Hooper)	25,000
21.—**Grange.** For road widening (Mr. F. H. Tulloch)	506
21.—**Heckmondwike.** For the construction of reservoirs (Major C. E. Norton) ...	320
21.—**Kettering.** For works of water supply (Mr. R. G. Hetherington)	1,932
21.—**Margate.** For the construction of a reservoir (Mr. F. O. Stanford)	9,252
21.—**St. Faith's.** For a housing scheme (Mr. W. M. Cross)	1,800
21.—**Southend.** For street improvement (Major J. Stewart)	6,424
21.—**Wolstanton.** For the erection of offices (Mr. Edgar Dudley)	1,000
21.—**Wood Green.** For street and sewerage works and the provision of an open space	2,587

		£
22.—**Chester.**	For street widening (Mr. Edgar Dudley)	2,910
22.—**Farnworth.**	For electricity purposes (Mr. H. R. Hooper)	3,400
22.—**Fleetwood.**	For street improvement (Mr. F. H. Tulloch)	1,772
22.—**Holmfirth.**	For works of water supply (Major C. E. Norton)	6,800
22.—**Northwood.**	For works of sewage disposal (Mr. R. G. Hetherington)	6,900
22.—**West Ashford.**	For works of water supply (Mr. F. O. Standish)	3,300
23.—**Whittlesey.**	For a housing scheme (Mr. W. M. Cross)	2,634
23.—**Billericay.**	For works of sewage disposal and surface-water drainage (Mr. R. G. Hetherington)	14,171
23.—**Flaxton.**	For works of sewage disposal (Major C. E. Norton)	1,000
23.—**Peterborough.**	For electricity and street works (Mr. W. M. Cross)	2,800
23.—**Prestwich.**	For street improvement (Mr. Edgar Dudley) ...	1,209
23.—**Wallasey.**	For road widening (Mr. F. H. Tulloch)	4,624
23.—**Westhoughton.**	For the provision of a refuse purveyer (Mr. H. R. Hooper)	1,600
24.—**Boston.**	For a housing scheme (Mr. H. S. Bidwell)	8,340
24.—**Chertsey.**	For works of surface-water drainage (Mr. R. G. Hetherington) ...	1,793
24.—**Chester.**	For works of water supply (Mr. F. H. Tulloch)	300
24.—**Padiham.**	For the provision of manure plant (Mr. H. R. Hooper)	900
24.—**Salford.**	For road improvement (Mr. Edgar Dudley)	520

TOWN PLANNING.

JULY.

27.—**Leeds.** (Mr. Thomas Adams) . . . —
28.—**Wallsend.** (Mr. George L. Pepler) ... —

AUGUST.

6.—**Surbiton.** (Mr. Thomas Adams) —

MARSHALL STEAM TRACTORS.

At the Highland and Agricultural Society's Show, which opened at Hawick on Tuesday, Messrs. Marshall, Sons & Co., Limited, Britannia Ironworks, Gainsborough, are the exhibitors of a 7-n.h.p. traction engine, a 5-ton steam tractor, a portable engine, and three threshing machines.

The traction engine is the firm's usual single-cylinder type, for 150 lb. working pressure, with gearing arranged on the three-shaft principle, designed for two speeds and incorporating the "Marshall" four-pinion system of differential gear.

The steam tractor, 5-ton compound type, with side-by-side high and low pressure cylinders, conforms in every respect with the requirements of the Heavy Motor Car Order. All the mechanical details are compactly arranged, but at the same time careful attention has been bestowed to ensure the requisite accessibility to parts requiring periodical supervision.

The firebox of the boiler, which is constructed for a working pressure of 200 lb. per square inch, incorporates the firm's cambered crown, a design which, it is claimed, considerably reduces the gross weight of the engine by the abolition of girder-roof stays. It also promotes economy in fuel consumption, and prolongs the life of the firebox, as, owing to the fact that the crown of the firebox is easily accessible, it can be readily kept clear of deposit, and therefore at its maximum efficiency.

Mechanical Filters.—Messrs. Mather & Platt, Limited, Manchester and London, have issued a new booklet dealing with their patent mechanical filters. Among the distinctive feature of the filters in question are a special washing gear, and the reduction to a minimum of the quantity of wash water. All the valves of the apparatus are at one level, and can be operated from the ground.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Have we not reached the stage in town planning when we could do with fewer papers and discussions? Has not the time arrived for more action and less talk, and are we not rather glutted with information and advice upon the subject?

* * * *

How long will it take us to find out what the average working-class family want in the way of accommodation in their dwelling houses? Do they or do they not require a parlour, or is a living-room-kitchen the acme of their wishes? Do they require a bath, or is it only used as a coal receptacle? Is a wash-house a necessity, and in the country must they have a bicycle shed? Are not these and many other questions the problems that beset the designer of the model "workman's dwelling"?

* * * *

Would it not be well if there could be given many more papers of the eminently practical type of Dr. John Gray's at the Blackpool Congress on the "Destruction and Prevention of Household Pests," in which he gives very simple and useful suggestions as to the manner in which rats, mice, blackbeetles, bugs, earwigs, mosquitoes, flies, &c., can be destroyed and their breeding minimised?

* * * *

May not the same be said of Mr. W. C. Tyndale's paper on "The Sanitation of the Country House," in which the author points out the various defects to be found in so many large country mansions, and the simple manner in which these defects may sometimes be remedied under skilful advice?

* * * *

Would not the Admiralty be well advised to ascertain if Dartmouth is in the insanitary condition pointed out by one of the Local Government Board's medical inspectors, with a view to placing it "out of bounds" for the cadets at the Naval College? Whence does this institution receive its milk and food supplies? And should not the "authorities" be on the alert?

* * * *

Why is the present period called "the age of stress and rush" when nearly everybody takes a tram, 'bus, tube or taxi whenever they want to go even a short distance? Was not the real age of stress and rush when people had to walk instead of riding luxuriously in a vehicle as is now the custom?

* * * *

How long will Londoners put up with the dislocation caused to traffic by the leisurely manner in which all street work in the Metropolis is carried out? For instance, when will the work in Fleet-street, which has already seriously disturbed the traffic for months past, be finished?

* * * *

Is it a fact that there is now on the market a sand or metal drying machine which will dry and heat sand to a temperature of 600 deg. Fahr. at the rate of 1 cwt. per forty-four seconds, or 4 tons per hour, or 12 tons of metal in the same time? If so, will it not greatly assist in the construction of roads on modern lines, and tend greatly to cheapen their cost?

* * * *

Have not the North Country members of the Institution of Municipal and County Engineers some cause to complain that the presidents are not often chosen from the North, when it is considered that out of the last seventeen presidents only one came from a town north of Crewe?

* * * *

How many surveyors interested in the important question of housing of the labouring classes in rural districts went to see the exhibition of designs for country cottages at the Surveyors' Institution? Was it not a very public-spirited action of the proprietors of *Concrete and Constructional Engineering* to offer upwards of £200 in prizes for the best designs of cottages built of concrete which could be erected for £125, and give the accommodation of parlour, kitchen, scullery, three bedrooms, and the necessary sanitary accommodation? But could any of the designs which were shown be erected for the money under the present wages difficulties?

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head a complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings: Barnsley £20,000, Derbyshire £12,000, Pittenweem £11,000, housing and town planning: Nottingham; roads and materials: Bradford; sewerage and sewage disposal: Audley £38,000, Morpeth £10,000, Skipton £8,700, water, gas and electricity: Birmingham.—Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Amesbury R.D.C.—The surveyor, Mr. J. T. [illegible], has received instructions to prepare specifications for the proposed bridge at Newton Tony. The plan provides a roadway of 22 ft., with a clear waterway of 12 ft., and the bridge is to be erected immediately in line with the road to the railway station.

Ballymoney U.D.C.—The council have received a report from a committee on the proposal to establish a public abattoir, and have adjourned the consideration of the matter.

Barnsley T.C.—The council on Tuesday adopted the recommendations of the special committee on the new town hall scheme, estimated to cost about £20,000.

Belper R.D.C.—The surveyor, Mr. Robert C. Cordon, reported recently that he had received fifteen sets of plans for the construction of a bridge over the river Derwent at Allestree. They were referred to the special committee appointed to deal with the subject.

Derbyshire C.C.—It has been agreed to build a new stone bridge over the Derwent at Baslow, according to plans prepared by the county surveyor, Mr. J. W. Heaton, the cost being estimated at £12,000.

Gower R.D.C.—It has been agreed to borrow £1,900 for the construction of a sea wall at Penclawdd to protect the main road from the encroachment of the sea at high tides. Mr. F. H. Glynn Price, the Duke of Beaufort's agent, has given permission for the widening of the road at the danger spot by 40 ft.

Hammersmith B.C.—As part of a larger scheme it is proposed to build a one-story building for the official staff, at an estimated cost of £6,000.

Harwich T.C.—The tender of Messrs. James & Ling, of Dovercourt, at £459, has been accepted for the completion of the groyne and landing-stage at Dovercourt.

Manchester T.C.—The Baths Committee have instructed the city architect to prepare plans for wash baths and wash-houses on a plot of land near Lower Moss-lane, Hulme.

Pittenweem T.C.—The council have adopted a scheme, estimated to cost £11,000, for the erection of a new town hall.

Ramsgate T.C.—It is proposed to extend the lavatory accommodation at the cliffs, at an estimated cost of £965.

Romford U.D.C.—It has been decided to construct a public convenience at Laurie-square, at a cost of £950.

Selkirk T.C.—The council have accepted the gift of swimming baths from Provost Allan and a number of other gentlemen, and have consented to allocate a site for the buildings.

Southampton T.C.—A resolution has been passed approving in principle that improved municipal offices should be provided at an early date, and a special committee has been appointed to go into the question.

Wandsworth B.C.—The provision of a mortuary and coroner's court is still under consideration. Some months ago the council accepted the offer of the London County Council to sell a site, with frontages to York-road and Barchard-street, for the sum of £1,210, provided an arrangement could be arrived at by which a coroner's court could be erected in conjunction with a mortuary, the London County Council paying a sufficient rent for the use of the court. At the suggestion of the London County Council a conference was held between their architect and the borough engineer, Mr. P. Dodd, and certain modifications were made in the plans. The estimated cost of the building, according to the modified plans, is £6,140, of which £3,762 is attributable to the coroner's court (including £692 for the site), and £2,378 for the mortuary (including £518 for the site).

Witham U.D.C.—The question of converting the old town reservoir into swimming baths has been referred to the Waterworks Committee.

HOUSING AND TOWN PLANNING.

Alcester R.D.C.—A scheme has been adopted for the provision of twelve workmen's cottages.

Crewkerne U.D.C.—The surveyor, Mr. B. Slade, has received instructions to complete plans and prepare tenders for twenty workmen's dwellings.

Gildersome U.D.C.—Plans and designs are invited for the erection of twenty houses at from £200 to £270 apiece.

Harwich T.C.—The council have approved the plans and specifications of the borough surveyor, Mr. F. H. French, for the erection of workmen's dwellings in the parish of St. Nicholas. Scheme I. consists of eight houses, to be built at a cost of £1,760, including the price of the land and legal costs, and Scheme II. of two houses at an inclusive cost of £380.

Horsham R.D.C.—The Local Government Board have approved generally of the council's housing proposals for Cowfold.

Irvine T.C.—A somewhat extensive housing scheme has been adopted, including the provision of ten double cottages and fifteen blocks of houses.

Londonderry No. 2 R.D.C.—A scheme has been passed for the erection of thirty-seven additional cottages.

Nottingham T.C.—The council on Monday adopted the scheme of the Housing Committee for the erection of workmen's houses in the Carter-gate area. The scheme involves the construction of several new streets.

St. Columb R.D.C.—A decision has been reached to build six workmen's dwellings on 2½ acres of land at Trekenning Four Turnings, which have been purchased for £200.

Stafford T.C.—A site costing £1,730 has been purchased for the erection of workmen's dwellings.

Taunton T.C.—The Health Committee have been empowered to advertise for tenders for the erection of twelve more workmen's dwellings in String-lane, similar to the existing houses erected by the council, but they have been asked to consider the principle of limiting the erection of future houses to the borough boundaries.

ROADS AND MATERIALS.

Antrim C.C.—A sum of £120 has been voted for the improvement of the footpaths of Carrickfergus.

Ballycastle R.D.C.—The council have agreed to a proposal to construct 8 miles of new road between Ballycastle and Cushendall, by Cushleake, subject to a grant from the Road Board of half the cost.

Barnard Castle R.D.C.—The surveyor, Mr. L. Simpson, has received instructions to carry out a scheme of improvement in Harwood-road.

Bradford T.C.—The purchase of properties in various streets has been sanctioned by the council for the purpose of schemes of widening and improvement.

Dawley (Salop) U.D.C.—A revised scheme, estimated to cost £297, has been adopted for road repairs at Jigger's Bank, and the county council will be asked for a contribution.

Dublin T.C.—For the more effective sweeping of the roads the Cleansing Committee intend to provide motor water wagons and an electrically-driven sweeping machine.

Dunbar T.C.—The Road Board have sanctioned a grant of £200 and a loan of £1,200 for a road improvement scheme.

Dundalk R.D.C.—Improvements estimated to cost [illegible]

Essex C.C. [illegible]

Fareham R.D.C.—The surveyor, Mr. J. F. Whitear, [illegible]

Huyton-cum-Roby U.D.C.—Powers have been [illegible]

Lewisham B.C.—It was stated recently, in the course [illegible] committee, that in the last two years the borough [illegible] nearly £40,000 on the roads, and all they had received from the Road Board was £5,000.

Littlehampton U.D.C. The Road Board have [illegible] £1,000 [illegible] payable [illegible] years [illegible] road improvements.

Melton Mowbray U.D.C. It has been agreed to [illegible]

Rugby U.D.C.—The dangerous corner at the top of Sheep-street is to be improved under a scheme of widening [illegible] by the council, it having been agreed to pay £1,900 for the land necessary for this purpose.

Totnes T.C.—An intimation has been received from the county council that they are prepared to defray half the cost of widening High-street, after deducting the Road Board grant of £1,000, their contribution not to exceed £1,250.

SEWERAGE AND SEWAGE DISPOSAL.

Audley U.D.C. The consulting engineer, Mr. M. [illegible] has received instructions to prepare a sewage disposal scheme for the Audley side of the district, at an approximate cost of £30,000. At the same time the council have approved a scheme for the Talke portion of the district, estimated to cost £8,000.

Battersea B.C.—It has been agreed to proceed with [illegible] in Surrey-lane and Sabine-road, at an estimated cost of £3,358.

Belper R.D.C.—It has been resolved to carry out [illegible] a scheme of sewage disposal for [illegible] Derby.

Bulkington U.D.C.—The plans of a scheme of sewerage have been completed and forwarded to the Local Government Board for approval.

Chipping Norton T.C.—The corporation have received the formal sanction of the Local Government Board to the new scheme of sewerage and sewage disposal, and have instructed the engineers, Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, to invite tenders for the carrying out of the scheme.

East Molesey U.D.C.—A scheme of flood prevention [illegible] at an estimated cost of £480.

East Westmorland R.D.C.—The council have instructed Messrs. Taylor & Wallin, civil engineers, of Newcastle-upon-Tyne and London, to prepare a scheme for, and report fully upon, the drainage of a section of the village of Tebay, including the railway station.

Hendon U.D.C.—Referring to the receipt of tenders for works of extension at the sewage farm, which had been referred to the surveyor, Mr. S. S. Grimley, for tabulation and report, Councillor Ford, at a meeting recently, said now that they had got the result of the work of the surveyor and his staff on this big scheme, he thought the occasion a fitting one on which to record on the minutes a vote of appreciation of the work carried out in the surveyor's department, and he formally moved that. Nothing he could say would add to what they all knew of the work that the surveyor and his staff had put in. Except in so far as they were compelled for the purposes of the Provisional Order inquiry to seek outside advice, the work had been done entirely in the surveyor's department, to the saving of a very large sum of money, something considerably more than the whole of the salaries of that department for a year. He thought the council should record its appreciation of that work. Mr. Ford said it was the biggest single scheme they had in hand in the district, and would be so for some time. Councillor Gardner seconded, and the vote was carried unanimously.

Leyburn R.D.C.—As a result of a report by one of their inspectors, the Local Government Board have made a series of recommendations for the improvement of the Leyburn sewerage.

Mexborough U.D.C.—For the sewage works extensions now being carried out by the council, under the engineer, Mr. Fenwick Carter, an order has been placed with Adams-Hydraulics, Limited, York, for two of their "Cresset" sprinklers, each of 116-ft. diameter. The contractor is Mr. Cliff, of Mexborough.

Monaghan U.D.C.—The Local Government Board have forwarded to the council the copy of a report by one of their inspectors, Dr. Bryan O'Brien, stating that the sanitary condition of the town was very bad, and could only be remedied by a proper sewerage system.

Morpeth R.D.C.—A scheme of sewage disposal is to be carried out at an estimated cost of £10,000.

Northallerton R.D.C.—The surveyor, Mr. T. G. Easdale, has received instructions to prepare the plan of a scheme of sewerage for Osmotherly.

Prestatyn U.D.C.—The council have adopted a sewerage scheme proposed by Mr. Blizard, consulting engineer, subject to the acceptance of a scheme already adopted provisionally for a discharge on ebb tide only.

Romford R.D.C.—The council have referred to the Upminster Parish Council a report by Mr. W. Fairley, consulting engineer, on the proposed scheme for the drainage of that district.

Skipton U.D.C.—The council on Tuesday approved of extensions to the sewage works estimated to cost £8,700. The scheme provides for an additional sedimentation tank, two new filters, 95 ft. in diameter, a storm-water tank, four humus tanks, and an additional sludge lagoon. When the proposed works are completed they will deal with a dry-weather flow of 700,000 gallons per day. Application is to be made to the Local Government Board to sanction the scheme and the borrowing of the money.

Walsall T.C.—On the presentation of the Sewage Farm Committee's report on Monday, the committee and the borough surveyor (Mr. J. Taylor) were congratulated on the completion of the new sewage purification works for less than £30,000.

Warwick T.C.—It has been found necessary to increase the loan for improvements at the sewage disposal works by £1,000.

Wealdstone U.D.C.—The council have accepted the tender of Adams-Hydraulics, Limited, York and Westminster, for six of their "Cresset" revolving distributors. The engineer is Mr. Herbert Walker, surveyor to the council.

Westhoughton U.D.C.—The Sanitary Committee recommend a further instalment of the water-carriage system, at an estimated cost of £2,000.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—The Lighting Committee recommend the provision of between fifty and sixty new street lamps.

Belper R.D.C.—The surveyor, Mr. Robert C. Cordon, has reported on the scheme for supplying the village of Allestree with water, and the matter has been referred to a committee.

Birmingham T.C.—The council on Tuesday adopted a report by the Water Committee, which recommended the council to proceed at once with the provision of a third pipe on the syphon sections of the aqueduct from the Elan Valley to Frankley, and that the committee should be instructed to submit designs and an estimate for the work. The council also approved designs and estimates for a balancing reservoir at Highter's Heath, Yardley Wood, and authorised the Water Committee to advertise for tenders, and to proceed with the work.

Bridgwater R.D.C.—A tender of £604 has been accepted in connection with the Othery water supply scheme.

Frome U.D.C.—The council have approved the plan of the surveyor, Mr. F. W. Jones, for laying out the proposed new suction-gas plant at the pumping

station, and have directed the surveyor to obtain tenders for the machinery. The estimated cost of the plant is £1,100, and it is hoped to save from £350 to £400 a year by the installation.

Kidderminster R.D.C.—The surveyor, Mr. G. J. Shepherd, has received instructions to prepare plans and estimates for a water supply for the parish of Chaddesley. The council have also decided to forward to the Local Government Board the plans for the water supply of Wribbenhall for their approval.

Lurgan U.D.C.—Arrangements have been completed for the purchase of the local gas company's undertaking for £40,000.

Poole T.C.—Extensions to the waterworks, estimated to cost £28,840, are recommended in a report by Mr. A. P. L. Cleverley, of Westminster.

Renfrew C.C.—The construction of the Bennan Loch waterworks for the supply of Eastwood and Mearns has been completed at a cost of over £20,000.

Taunton T.C.—The accounts of the electricity undertaking for the past year show a nett balance of £178, and from the profits of the water undertaking £500 has been paid over to the rates.

Walsall T.C.—It was reported on Monday that the sanction of the Board of Trade had been received to the erection of the new electricity works on the site proposed by the town council. In presenting a report from the Gas Committee, Mr. Venables mentioned that it was proposed to expend £10,000 upon various improvements.

MISCELLANEOUS.

Cardiff T.C.—The council on Monday adopted a proposition approving of a crematorium in principle, and asking the Parks Committee to report on the subject.—The Public Works Committee submitted a recommendation that the city engineer, Mr. W. Harpur, be allowed to hire a motor car when necessary, whereupon Sir John Courtis moved the reference back of the minute with a recommendation that the committee should consider the advisability of buying a car for the use of the city engineer. Sir John said that when he was in Canada he found that all the chief city officials were provided with motor cars. The time had come long ago when the city engineer of Cardiff and the electrical engineer should be provided with a motor car each, to facilitate the discharge of their duties. Councillor A. J. Howell seconded, and said it was time that the departments of the city were run on business lines. Alderman W. Roberts, chairman of the Public Works Committee, explained that the recommendation was intended to be an experiment for a year to ascertain the relative cost of buying or hiring a car, and Sir John Courtis withdrew the amendment.

Swansea T.C.—The General Purposes Committee, in response to an application from the promoters of the Gower Light Railway for a contribution towards the cost of the construction of the line, recommend the corporation, subject to certain conditions, to contribute a sum of £5,000. The Gower Council has already made a similar contribution, and in the event of that of Swansea being confirmed by the council, the Treasury has power to make a contribution of an equal amount to those made by public authorities—or, in this case, £10,000.

Town Planners at Birmingham.—The members of the International Garden Cities and Town Planning Association, who are on a tour of an educational character, arrived in Birmingham yesterday, and were welcomed by the Lord Mayor (Lieut.-Colonel Martineau) at the Council House. The company included representatives of France, Germany, Holland, Italy, Poland, Russia, Spain, Canada, Australia, India, and America. In the course of the proceedings a paper on the progress of town planning in Great Britain was read by Mr. Henry R. Aldridge, secretary of the National Housing and Town Planning Council. Mr. Aldridge suggested that the standard of a normal, healthy home for a workman's family should be three bedrooms, a large living room, a scullery, and a bath, and, wherever possible, a parlour. Many thousands of English artisans already enjoyed homes of this standard, and, given adequate public attention to the housing question, we were within measurable distance of securing it as the normal type of a workman's home in industrial England.

PERSONAL.

Mr. S. A. Hill-Willis, surveyor to the Tilbury Urban District Council, has received an increase of salary.

Mr. T. W. Plews, surveyor to the Startforth Rural District Council, has had his salary increased by £20 per annum.

Mr. O. M. Prouse, surveyor to the Ilfracombe Urban District Council, has been voted an increase of salary of £20 per annum.

Mr. G. W. Lacey, borough surveyor of Oswestry, has received an increase in his salary of £50 per annum, making it £300.

Mr. R. M. Stone, assistant county surveyor of Somerset, has been appointed county surveyor for the Northern Division of Devon.

Mr. A. E. Smith, surveyor to the Hay Urban District Council, has been appointed surveyor and inspector to the Petersfield Urban District Council.

Mr. Henry Gregson, surveyor to the St. Annes-on-Sea Urban District Council, who has resigned, has been retained as consulting surveyor, at a salary of £100 per annum.

Mr. G. H. Jack, county surveyor and architect of Herefordshire, has been voted unanimously an increase of salary by the county council. This is the fourth increase he has received during his term of office, extending to seven years.

Mr. C. W. Leney, surveyor and inspector of the East Preston (Sussex) Rural District, has had his salary reconsidered and fixed at a total of £173. The council have also agreed to appoint an assistant surveyor at a salary of £65 a year.

Mr. A. Stanley Northover, assistant to Mr. E. Plummer Davies, engineer and surveyor to the Tisbury Rural District Council, was last week appointed assistant surveyor to the Kidderminster Rural District Council. Mr. Northover served as articled pupil with Mr. Davies.

Mr. Thomas Cole, ASSOC.M.INST.C.E., formerly secretary, and now consulting secretary, to the Institution of Municipal and County Engineers, has entered into private practice as a consulting engineer with the firm of Pollard & Tingle, 31 Old Queen-street, Westminster.

Mr. F. W. Macaulay, at present the Elan water supply resident engineer, was on Tuesday last appointed by the Birmingham Town Council supply engineer, at a salary of £1,200 per annum. The council also authorised the Water Committee to appoint a temporary assistant engineer, at a salary not exceeding £600.

Mr. Francis Wood, M.INST.C.E., F.G.S., whose paper on "The Economies of Modern Methods of Road Construction," read at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham, was reproduced in THE SURVEYOR of last week, is the engineer and surveyor of the Metropolitan Borough of Fulham, and has occupied that position twelve years. He is a native of Liverpool, and was trained at the Walker Engineering Laboratories under Dr. H. S. Hele-Shaw, LL.D., F.R.S., Liverpool University. He has occupied various positions, serving as assistant under the municipalities of Wakefield and Leicester, and as chief at Bacup, Lancs. He is the author of "Practical Sanitary Engineering" and "Modern Road Construction." He has made a special study of the use of bitumen in road construction, and was awarded the Triennial Prize of 750 francs by the International Road Congress, 1913, for the paper that would best promote the construction and maintenance of roads for modern traffic.

City of London Improvement.—At the meeting of the City Corporation last week sums amounting to £37,000 were voted for acquiring interests in property required for the widening of Leadenhall-street. A plan for disposal of the surplus land by public auction or private treaty was also approved.

London Borough Councils and Electricity.—The Metropolitan Borough Councils Standing Joint Committee has resolved to appoint a special committee, to consist of representatives of the London borough councils owning electricity undertakings, to consider the desirability of taking immediate steps to provide a joint supply for the metropolitan area.

£5,000,000 FOR COTTAGES.

A Bill [illegible] the Government proposes to [illegible] in carrying the development of housing accommodation in the rural areas and an additional two millions for housing the [illegible] in Government works after sufficient dwellings were not available, was introduced and read a first time in the House of Commons by Mr. Rowlands, President of the Board of Agriculture. Mr. Runciman said the Government had decided that the [illegible] should be three to a central authority, and so far as the agricultural districts were concerned they had decided to entrust it to the Board of Agriculture. The three millions for rural housing would be under the control of the Government Department, and not of private individuals. The Treasury had undertaken to borrow the money by means of terminable annuities for a term not exceeding thirty years. The rents would not provide for the repayment of the money after thirty years, and the Government, while letting the houses on an economical basis, would make the period of repayment more nearly approach the age of the cottages. The sinking fund on the land would not be charged to the occupiers of the cottages. The Bill was read a first time.

In the House of Commons on Monday a question was put as to whether it was proposed under the Bill to provide houses for agricultural labourers in purely rural districts only or in semi-industrial areas also, where they were apt to be crowded out of the available cottages by the higher paid employees of more profitable industries; whether it was proposed to let all Government cottages at a full economic rent representing 5 per cent upon the capital outlay; whether a garden would be provided in every case; and, if so, what would be its minimum area.

Mr. Runciman said the answer to the first part of the question would be found in Clause 1 of the Bill. It was the intention of the Government that all the cottages provided should be let at an economic rent, but he was not prepared to accept absolutely the questioner's definition of that phrase. Gardens would be provided wherever necessary; the size would naturally depend upon various circumstances, and he was not prepared to pledge himself to a minimum.

"Three Towns" Amalgamation.—The Bill to confirm the Local Government Board Provisional Order granted to Plymouth for the amalgamation of the Three Towns (Plymouth, Devonport, and Stonehouse) was approved by the Select Committee of the House of Commons on Wednesday.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED, in North Staffordshire, an expert [illegible] man to manufacture Tarred Slag. Apply Box 1,111, Office of THE SURVEYOR, 24 Bride Lane, Fleet-street, E.C. (1,798)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

ASSISTANT TO THE COUNTY SURVEYOR.

Applications are invited for the appointment of a General Engineering Assistant on the Staff of the County Surveyor. Candidates must have had experience [illegible] the Office of a County Surveyor, and be [illegible] the use of [illegible] construction.

Salary £[illegible] per annum, rising by annual increments of £[illegible] to a maximum of £250. Age not to exceed 40.

The appointment will be subject to three months' notice given or received. No superannuation or pension [illegible] appointment.

A medical examination will be a condition precedent to the appointment.

Applications, with not more than three recent testimonials (copies), both as to ability and good character, to be received at the office of the County Surveyor, Chelmsford, not later than Wednesday, August 5th.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
July 15, 1914. (1,797)

PEWSEY RURAL DISTRICT COUNCIL.

DISTRICT SURVEYOR.

Applications are invited for the Appointment of District Surveyor.

Salary £90 per annum. The person appointed will be required to devote his whole time to the service of the Council. He will also be required to give a Bond for £200 in an approved Guarantee Office.

Applications, in Candidate's own handwriting, stating age and previous experience, together with copies of three testimonials of recent date, must reach me not later than the 8th August next.

ROBERT DIXON,
Clerk to the Council.

Pewsey.
July 15, 1914. (1,794)

URBAN DISTRICT COUNCIL OF DENTON.

EXTENSIONS OF SEWAGE DISPOSAL WORKS.

The above Council invite Tenders for the construction of twelve New Circular Percolating Filters, together with Humus Tanks, Automatic Dividing Chambers, and other works in connection therewith.

Plans may be seen, and General Conditions, Specifications and Forms of Tender may be obtained, at the office of Mr. Jno. B. Cooke, Engineer and Surveyor to the Council, Town Hall, Denton, near Manchester, between the hours of 9.30 and 11 in the morning of any week-day after Tuesday, the 21st July, 1914, upon payment of three guineas, which sum will be returned on receipt of a *bonâ-fide* Tender.

Tenders, sealed and endorsed "Sewage Works Extensions, Contract No. 4," must be sent in to me so as to be received by me not later than Saturday, the 15th August, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WM. RICHARDS,
Clerk to the Council.

Town Hall, Denton,
Near Manchester.
July 15, 1914. (1,799)

BOROUGH OF MARLBOROUGH.

CAST-IRON PIPE SEWER.

The Corporation invite Tenders for the laying of about 276 yds. of 6-in. Cast-iron Pipe Sewer in the College Grounds.

Plans may be seen, and Specifications, Quantities and Form of Tender obtained, at the office of the Borough Surveyor, Mr. G. Parker Pearson, ASSOC.M.INST.C.E., Marlborough, on the deposit of half-a-guinea, which sum will be returned on the receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Sewer," to be delivered at my office not later than 10 a.m. on Wednesday, the 29th inst.

The Corporation do not bind themselves to accept the lowest or any Tender.

E. LLEWELLYN GWILLIM,
Town Clerk.

Marlborough.
July 15, 1914. (1,796)

BECKENHAM URBAN DISTRICT COUNCIL.

TO TAR-MACADAM CONTRACTORS.

The Beckenham Urban District Council invite Tenders for the Supply and Delivery to Bromley South Railway Station (L.C. & D.Rly.) of 150 tons of 1½-in. Tarred Slag.

Specifications and Forms of Tender obtained on application to Mr. John A. Angell, Surveyor, on and after 18th July, 1914, on the production of a receipt from the Collector for a deposit of £1, which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall pay to the employees the wages generally accepted as current for workmen engaged on similar work in the Town where the work is executed.

Tenders, duly sealed and endorsed "Tenders for Tarred Slag," to reach undersigned not later than 4 p.m., Monday, July 27, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
F. STEVENS,
Clerk of the Council.

(1,795)

REINFORCED CONCRETE ROAD FOUNDATIONS.

[illegible]

[illegible]

establish the finished road surface. If, for instance, wood blocks are to be used instead of a shallow type [illegible] concrete strength crust rather than to carry out a general excavation to a greater depth. In all these cases the use of a reinforced-concrete strength crust may be considered as an alternative to other methods of obtaining a crust of sufficient strength. The proper

[illegible]

position of the reinforc[illegible] number of consideration [illegible] and can only be determined [illegible] applied mechanics [illegible] y, however, there are [illegible] in which the position of the reinforcem[illegible] available.

To meet these cases [illegible] being in the running in competing methods in a far larger [illegible] ons, the British Reinforced [illegible] upplied in a number of [illegible] set fairly close together [illegible] red length, and they can therefore be put [illegible] the minimum of obstruction to traffic and [illegible] per square yard when the strongest meshes are required, and it is supplied in a considerable range of strengths. A rough test calculation, assuming that the strength crust had to bridge a weak spot, showed that a reinforcement in one of the middle strengths of the series would give to a 9-in. concrete crust an [illegible] reinforced crust would serve a purpose which could not be served by a plain concrete crust however great its thickness.

[illegible] the relatively light bars which are used in this reinforcement may easily be cut through by chisels at the same time as the concrete. The cutting of these bars, breaking their continuity, would, of course, make it somewhat more difficult to make good after trenching than it is in the case of plain concrete; but this would not necessarily cost more than making good with plain concrete, and could usually be made more effective. For really permanent strength crusts which need hardly ever be disturbed, the reinforced concrete has a decided advantage over plain concrete which, especially under the conditions of rural roads, has a much greater tendency to crack with the lapse of time. In some cases, where the natural foundation [illegible] for the wearing crust to rest upon, [illegible] to crack. In this direction the use of a light reinforcement in a thin concrete crust is worth consideration, and may, perhaps, be considered promising of development.

In a pamphlet which they issue the British Rein- [illegible] which, though sanguine, are by no means extravagant, with respect to the merits of reinforced-concrete strength crusts for roads, and if to the useful simplicity of their main idea this firm add the subtleties of design necessary to meet specific difficulties, they [illegible]ld obtain a fair share of the work of road con- [illegible]ion in the near future.

The Civil Engineer's Year Book, compiled by the [illegible] AND COUNTY [illegible] is remarkably [illegible] is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Metropolitan Water Board's New Offices. At a [illegible] Water Board approved of the estimate of £100,000 in respect of the [illegible] New River head in Rosebery-avenue, and appointed Mr. H. Austen Hall (author of the selected design) architect, to carry out the work. The General Purposes Committee were instructed to obtain and submit tenders for the erection of the building.

Japanese Street Pavings.—An American consular report states that modern street pavements are as yet practically unknown throughout Japan. Outside of the business districts of the more important cities [illegible] of footpaths for pedestrians. As a rule these streets, when paved at all, are macadamised as cheaply as possible, and their condition in the congested traffic districts is generally very unsatisfactory. It is stated that in the city of Tokio, which has a population of about 2,000,000 persons, there is but one steam roller used in this work. A few experiments in street paving were recently conducted in Tokio under the direction of the city authorities, but with poor results. In these experiments wood blocks coated with a thin covering of asphalt were used, and the streets paved with this material are already showing signs of wear.

SOME RECENT PUBLICATIONS.*

A Treatise on Roads and Pavements. By Ira Osborne Baker, [illegible] Professor of Civil Engineering in the University of Illinois. Second edition. Price 21s. net. London: Chapman & Hall.

Prof. Baker's work [illegible] engineering literature is so well understood, that little [illegible] tion than an indication of the nature and extent of the new matter. But for the convenience of engi- [illegible] and especially [illegible] to be well [illegible] and [illegible] 1 [illegible] 1 [illegible] 709 pages, with 171 figures, and 68 tables of data. The new matter consists of [illegible] Macadam Roads and Concrete Pave- ments, and in view of the relatively small extent of this addition it may be remarked that the author [illegible] for illustrations, these forty-two pages being occupied by a summary of leading facts, data, and specifications. The first edition was issued in 1902, but although this implies that the book, except for the last chapter, was written without reference to the experience of the intervening period, the subject- [illegible] supplied on account of this. Much of the [illegible] principles, are valuable; and Prof. Baker's treatise is very valuable. It is divided into two parts, deal- [illegible] 229 pages, and street pavements, 354 pages, besides the new [illegible] 42 pages.

Part I. Country Roads commences with a chapter on Road Economics, 14 pages, including costs, data of transport by wagons, and the well-known matter relating to tractive resistance, including Prof. Baker's much-quoted tables of data. Road administration, road taxes, and costs of roads are also considered in this chapter. Chapter II. is an economic and mathematical study of road location, and should not be overlooked by those who are reading up this subject at [illegible] Chapter III., 75 pages, and Chapter IV., 31 pages, are on Earth Roads and Gravel Roads respectively, and as regards roads of these kind, it may be remarked that Prof. Baker's special knowledge is of great value, and that his chapter contains a large amount of precise information. Chapter V., 86 pages, is on Broken Stone Roads, and includes matter relating to tests and properties of materials, notes on the chief kinds of stone, methods of construction, examples of cross-sections, machinery, binders, costs of quarrying and crushing, and costs of rolling. About thirteen pages are devoted to road maintenance, and, though the matter is good, this is necessarily a subject with regard to which the lack of more recent experience is felt, and by no means made up for by the supplementary chapter. In Chapter VI., 13 pages, Miscellaneous Roads, there are brief descriptions of stone and steel wheelways, burnt clay roads, and plank roads; and Chapter VII. is on Equestrian Roads, 2 pages, and Horse Race Tracks, 15 pages. The idea of laying out racecourses with calculated superelevations is not one which appeals to British readers, and we are, fortunately, not obliged to devise artificial surfacings for horse racing. "The surface," we read, "should be formed of a soil that packs well and does not 'cup'—*i.e.*, curl up when sprinkled. Clay, loam, gumbo, sandy loam and muck are all good. If the natural soil is clear sand it should be covered with a top dressing of clay or loam 3 in. to 4 in. deep, which is then thoroughly harrowed in."

Part II., on Street Pavements, begins with a short chapter on Pavement Economics, relating to American conditions, but of general interest in comparative studies of the subject. Chapter IX., 28 pages, is on Street Design: Planning, Widths, Street Grades, Cross-sections, and Street Trees. As regards trees, the author writes: "It is always desirable, both for the shade and for the appearance, and usually possible, to have the streets, at least those devoted to residences, lined with trees on each side." Trees in the street "have an important sanitary and æsthetic value." The brief treatment of the subject is useful and suggestive. The subject of Street Drainage, Chapter XI., is presented in [illegible] 14 pages, and about 10 pages are devoted to [illegible] The various types of street paving are then considered, and, in view of the changes that have occurred in the relative importance of different types in the past twelve years, it may be of advantage to note that the space is allotted [illegible] Pavements, including "Asphalt Macadam" and Tar- [illegible] 76 pages; Block Pavements, 66 pages; Stone-block Pavements, 21 pages; Wood-block Pavements, 14 pages; Comparisons of Pavements, 27 pages; Side Walks, 34 pages; Bicycle Paths, 9 pages; Bicycle Race Tracks, 14 pages. The volume concludes with the new chapter on Automobile Roads and Concrete Pavements. In this chapter the author [illegible] Method of Supplement. But 9 pages, the passages relating to ordinary watering and sea water sprinkling together occupying only sixteen lines. Protective coatings are then considered, including Paint Coats and Bituminous Carpets, the New York standard specifications for the latter being given; the method corresponding to our tarring and strewing [illegible] Bituminous Macadam [illegible] allotted 16 pages. Concrete Roads 6 pages. It is to be regretted that the author has not written a much longer supplementary chapter, the space allotted for the consideration of these subjects being hardly adequate in view of the large amount of experience with bituminous-bound roads which has been obtained in Europe, and much of which might suitably be put before American readers, one would suppose. However, this last chapter serves to bring the work up to date as regards certain main essentials of bituminous-bound and concrete road crusts, and the book, as a whole, contains so much important and useful matter that the publication of a second edition may certainly be regarded as justified. It may also be observed that unless an author is prepared to make a very thorough revision of such a work as this, it is far better to bring out a second edition with a little supplementary matter than to attempt the impossible task of freshening up the original work by little touches and small additions here and there. Prof. Baker has wisely chosen the former course, and this fresh impression with its small, but useful, addition will therefore be welcomed by all who value sound literary work on engineering subjects.

The London Building Acts. By Prof. Banister Fletcher, D.L., F.R.I.B.A. (Fifth edition.) Price 10s. nett. London: B. T. Batsford, Limited.

This work comprises in a compendious form the various statutes, by-laws, standing orders, and regulations relating to buildings within the Metropolitan area. The present edition has been brought up to date, and the arrangement of the book has been recast by dividing it into thirteen sections, each headed by a table of contents. The annotations to the principal Acts include cross-references and notes of cases elucidating the various statutory provisions. The fresh matter extends to 211 pages, but owing to the use of a specially made paper, combining thinness and opacity, and the rearrangement of the letterpress, the handy size of the volume remains unaffected by the additions. The utility of the book is greatly increased by the diagrams which, upon the principle that "seeing is believing," show at a glance the nature of the various statutory requirements as to height, walls, chimneys, air spaces, &c. A list of district surveyors is added. To London architects, surveyors, and builders the book should prove indispensable.

Renfrewshire Roads.—The road surveyor for the Upper District of Renfrewshire, Mr. Robert Drummond, in his annual report to the members of the District Committee, states that the roads continue to be well maintained. The change from the old to the modern method of maintenance is being generally adopted. To assist in extending and carrying on these improved methods, the Road Board have given a grant in aid for the current year of £1,600. In connection with surface tarring for the abatement of the dust nuisance, it has been found that the application of larger and properly graded chippings strengthens and improves the road surfaces on which there is medium traffic. The main roads between Glasgow and Ayrshire are receiving special attention, so as to get a surface capable of carrying the heavy traffic passing over them.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

MOTOR OMNIBUS TRAFFIC.

LORDS' COMMITTEE AND MIDDLESEX BILL.

On Friday last a Select Committee of the House of Lords passed the Middlesex County Council's Bill to authorise the construction of a road 3 miles long and 80 ft. wide from Chiswick to a point in Hanwell, along the Bath road at Hounslow, giving a new route to the West of England, and relieving the congestion of Brentford High-street.

As is well known, a clause of the Bill empowers the county council to charge the omnibus companies three-eighths of a penny per car-mile towards the expense of maintaining the road, but it was reported on Monday that the decision of the Committee will not be accepted as final by the companies, and that an appeal will be made to have the Bill recommitted.

Among those who gave evidence were the city surveyor of Westminster, Mr. J. W. Bradley, and the borough engineers of Marylebone (Mr. J. P. Waddington) and Fulham (Mr. F. Wood), who expressed the view that motor omnibus traffic did no special damage to well-constructed highways. It was also asserted that if a charge of anything like three-eighths of a penny per car-mile were levied upon the motor omnibus services throughout London the companies' profits would be eaten up and the whole of the services would be stopped.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

MEETING AT HACKNEY.

A meeting of the institution is to be held in the Metropolitan District at the Town Hall, Hackney, to-morrow (Saturday), the 18th inst.

Programme.

2.15 p.m.—By kind permission of the chairman and members of the Town Hall Committee, members will assemble in the council chamber and will be welcomed by the Mayor of Hackney, Councillor Chas. Winkley, J.P.

Discussion on paper, "Notes on the Refuse Destructor Works and Electricity Undertaking of the Borough of Hackney," by Mr. L. L. Robinson, M.INST.C.E., M.INST.E.E., borough electrical engineer.

2.30 p.m.—Special meeting. Confirmation of Articles of Association and by-laws.

Discussion resumed.

3 p.m.—Leave town hall in motor conveyances (fare 2s. 6d.) to visit refuse destructor and electricity works, the latter including extension of buildings, boiler-house, coal bunkers, transporter, &c. Mr. Robinson has kindly consented to be present and accompany the members through the works, pumping station, filter-beds, &c., of the Metropolitan Water Board at Lea Bridge, thence to King Edward VII. reservoir, Chingford, to inspect the Humphrey pumps, &c., by the kind permission of Mr. Wm. Booth Bryan, M.INST.C.E., member of the institution, chief engineer of the Metropolitan Water Board, who will be present and accompany the members.

Return to town hall for tea, by invitation of the hon. secretary, Metropolitan District.

Norman Scorgie, M.INST.C.E.,
Hon. District Secretary.

Hackney.

EASTERN DISTRICT MEETING AT TILBURY.

An Eastern District meeting will be held at Tilbury on July 25th.

Programme.

10.15 a.m.—Members will assemble at Tilbury Dock Railway Station, where they will be received by the chairman of the urban district council (Mr. Alexander Brennan, J.P.).

10.20 a.m.—Inspect underground convenience, Broadway (opposite railway station), section of Tarmac, &c.

10.30 a.m.—Enter premises of Tilbury Dock, by kind permission of Mr. C. R. S. Kirkpatrick, M.INST.C.E., and pass through existing docks to the works for Tilbury Dock extension (Messrs. Topham, Jones and Railton's contract). In points to be visited on these works being: (*a*) The block-making yard, and ballast washing and screening plant; (*b*) general excavation in progress between dock [illegible] on contract [illegible] in progress; (*c*) construction of new shed No. 1 and railways in progress. Driving of "Simplex" piles for foundation of sheds Nos. 2 and 3.

12.15 p.m.—Members will proceed to the works on construction of new river jetty (Messrs. Perry & Co.'s (Bow), Limited, contract). Inspect cylinder sinking, pile driving, and reinforced concrete construction.

12.35 p.m.—Members will proceed across main entrance lock and two dry docks, and by way of quay on east side of basin to Tilbury Hotel.

1 p.m.—Members will partake of luncheon at the Tilbury Hotel.

2 p.m.—Discussion on paper, by Mr. S. A. Hill-Willis, on "Tilbury and Some Particulars of a New Sewerage Scheme in the Adjoining Rural District."

2.45 p.m.—Members will proceed by motor conveyances to the World's End and through the adjoining rural district to Stanford-le-Hope: (*a*) To inspect river frontage purchased by Midland Railway Company; (*b*) to proceed to and inspect Tilbury Fort gateway and septic tank installation.

3.30 p.m.—Arrive Stanford-le-Hope sewage disposal works.

4.15 p.m.—Members will return from Stanford-le-Hope *viâ* Tilbury North Ward, passing *en route*: (*a*) Site for housing North Ward; (*b*) site for housing South Ward; (*c*) private streets improvements works (in progress); (*d*) Tilbury mortuary and post-mortem room.

4.45 p.m.—Tea at the Tilbury Hotel at the invitation of Mr. S. A. Hill-Willis, followed, if desired, by further discussion on paper.

J. A. Webb,
Hon. District Secretary.

Great Stanmore.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future.

J. W. Dudley Robinson, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Horace Boot, M.I.E.E., M.I.MECH.E.

EASTERN AND NORTH-EASTERN DISTRICT.

A visit will be paid to Hunstanton on August 15th, 16th and 17th.

There will be no business or other meetings, and ladies and friends of members (including family parties) are specially invited. It will form purely a trip to the seaside, with the opportunity for members to meet on a purely friendly footing.

Arrangements will be made for luncheon (at 1.30) and tea (at 5.30) at the Railway Hotel on the Saturday, and it is hoped that all attending will meet at those times. (Approximate cost for luncheon and tea, 2s. 9d. per head.)

Those who desire may make the one-day trip only, but those seeking accommodation for an extended period (two or three days or more) are advised to notify me at the earliest possible date, not later anyway than July 24th. Full particulars of Hunstanton, with a list of hotels and boarding-houses,

[illegible]

Yorkshire, will be held at Harrogate on Saturday, September 12th.

[illegible]

39 Victoria-street, S.W. *Secretary*

APPOINTMENTS VACANT.

[illegible] *on* WEDNESDAYS *to ensure their inclusion in the weekly list of* [illegible]

[illegible] July 21st.—Corporation of Swansea. £400 per annum.—Mr. H. Lang Coath, town clerk.

[illegible] Workington. £2 5s. per week.—Mr. H. Bowman Williams, borough engineer and surveyor.

[illegible] Dinas Powis Rural District Council. £2 10s. per week.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

[illegible] —Mr. T. J. Rushbrooke, borough engineer [illegible] veyor.

SURVEYOR.—July 23rd.—Freebridge Lynn Rural District Council. £80—£100.—Mr. G. A. Hayes, clerk, 19 King-street, King's Lynn.

[illegible]

SURVEYOR'S ASSISTANT.—July 25th.—Pontypridd Urban District Council. £60—£90.—Mr. J. C. Jones, clerk.

SURVEYOR'S TEMPORARY ASSISTANT.—July 25th.—Frome Urban District Council. £78 per annum.—Mr. F. W. Jones, engineer and surveyor.

COUNTY SURVEYOR.—July 25th.—Kildare County Council. £400—£500.—Mr. Thomas Langan, secretary, Courthouse, Naas.

[illegible]

ENGINEER AND SURVEYOR.—July 27th.—St. Annes-on-the-Sea Urban District Council. £250 per annum.—Mr. T. Bradley, clerk.

WATERWORKS ENGINEER.—July 28th.—Corporation of Rotherham. £120—£140.—Mr. C. L. des Forges, town clerk.

ASSISTANT DRAINAGE ENGINEER.—July 30th.—Madras Corporation, India. £33 6s. 8d. per month.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

[illegible] July [illegible] per [illegible]

[illegible] Cowland, clerk, Bodmin.

[illegible]

COUNTY SURVEYOR.—August 19th.—Longford [illegible] County Council Office, Longford.

[illegible] Whitehall-gardens, London.

[illegible] the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

[illegible] cottages, for the Chapel-en-le-Frith Rural District Council. Premiums, ten, five, and two guineas. The Clerk, Stockport.

REIGATE.—July 25th.—Designs for a police and fire station, for the Corporation of Reigate. Premiums 40, 20, and 10 guineas.—Mr. A. Smith, town clerk.

LONDON. September 7th.—Designs for two new schools, for the London County Council.—The Clerk, Spring-gardens, London, S.W.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

[illegible] educational offices, for the Education Committee.—Mr. J. E. Jarratt, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. [illegible] IN THE FOLLOWING DAY'S ISSUE, [illegible] *on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later con-* [illegible]

[illegible]

[illegible] tion of a school at Horsham, for the Joint Education Committee.—Mr. Hadyn P. Roberts, education architect, Thurloe House, High-street, Worthing.

HERTS.—July 20th. For the enlargement of Byng-road county council school, Barnet, for the Education Committee.—Mr. Urban A. Smith, county surveyor, Hatfield.

SOUTHAMPTON.—July 20th.—For the partial reconstruction of Stoning Bridge, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

SOUTHAMPTON.—July 20th.—For the reconstruction and strengthening of four small bridges, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

HEBBURN.—July 20th.—For the erection of classrooms and cloakrooms, for the Education Committee. [illegible] Offices.

EDINBURGH.—July 20th—22nd.—For the erection of a public washhouse, for the corporation.—Mr. J. A. Williamson, architect, Public Works Office, City Chambers.

PRESTON.—[illegible] offices, weighbridges, and public conveniences, for the corporation.—Borough Surveyor.

SWINEFORD.—[illegible] nine cottages, for the rural district council.—Mr. T. R. McNulty, clerk.

KENT.—[illegible] for the county council. Mr. F. W. Ruck, county [illegible]

YEADHEATH.—[illegible] elementary school, for the Education Committee.—Borough Surveyor.

WELLINGTON.—[illegible]

TOTTENHAM.—[illegible]

WEST HAM.—[illegible]

[illegible] Jenkins, town clerk.

DEVON.—[illegible] Richmond-road, Exeter.

[illegible] workmen's houses, for the urban district council.—Mr. W. J. Davies, surveyor.

[illegible] G. Jerram, surveyor.

PARKFORD.—[illegible] chapel at the cemetery, for the urban district council.

[illegible]

EAST [illegible] foundations and retaining walls for a new hospital, for [illegible] James-street, London, W.C.

WINCHCOMB.—July 25th.—For the erection of six cottages, for the rural district council.—Mr. T. Malvern, architect, 21 Winchcomb-street, Cheltenham.

EXMOUTH.—[illegible] soted timber piling, pile driving, sea defence works, [illegible] district council.—Mr. Samuel Hutton, engineer and surveyor.

HEMEL HEMPSTEAD.—July 27th.—For the erection of fourteen cottages, for the rural district [illegible] Hemel Hempstead.

MARGATE.—July 27th.—[illegible]

ERITH.—July 27th.—For the erection of a school. [illegible]

SLATON DELAVAL.—[illegible]

MANCHESTER.—July 28th.—For the erection of tramway offices and public conveniences, for the Tramways Committee.—Mr. J. M. McElroy, general [illegible]

BROMLEY.—August 1st.—For the erection of eight cottages, for the rural district council.—Messrs. Potter & Harvey, architects, 49 London-road, Sevenoaks.

WANTAGE.—August 3rd.—For the construction of six workmen's dwellings in three pairs, together with the construction of a sewer, house and surface-water drains, sinking a well, and erection of fencing, for the rural district council.—Mr. John W. Harris, engineer and surveyor.

GLASGOW.—[illegible] Cochrane-street.

LETCHFIELD.—[illegible] —Mr. H. Howard, surveyor, Town Offices.

GRANTHAM.—[illegible]

[illegible] and [illegible]

[illegible] Howley, [illegible]

FROME.—July 23rd.—For the supply and erection [illegible] provided at the water pumping station, for the urban district council.—Mr. F. W. Jones, Public Offices, [illegible]

SLEAFORD.—July 25th.—For the supply, laying [illegible] Sleaford.

TENDRING.—July 27th.—For the supply of 2,190 yds. of 3-in. cast-iron water main, for the rural district council.—Mr. S. Francis, engineer, Town Hall Buildings, Clacton.

Roads.

ARGYLL.—July 18th.—For road repair, widening, and improvement, for the Cowal District Committee.—Messrs. W. & W. Disselduff, joint district clerks, 160 Argyll-street, Dunoon.

MONMOUTHSHIRE.—July 18th.—For the construction of a new road, for the county council.—Mr. W. Tanner, county surveyor, Newport, Mon.

MARGATE.—July 20th.—For the supply of 1,500 tons of unbroken pit flints, and 1,000 tons of 2-in. broken and sifted pit flints, for the corporation.—Mr. E. A. [illegible]

GRANTHAM.—July 20th.—For excavating and laying a school playground with tar-macadam, for the [illegible]

WITHAM.—July 20th.—For the hire of steam roller and scarifier, for the urban district council.—Mr. W. P. Perkins, surveyor, Witham, Essex.

PRESTON.—July 20th.—For making up back roads, for the corporation.—Borough Surveyor.

[illegible] flagged footway, for the urban district council.—Mr. [illegible]

BRENTFORD.—July 20th.—For wood and granite sett paving, for the urban district council. Mr. J. W. Croxford, surveyor.

[illegible] of passages, for the corporation. Mr. A. E. Prescott, borough engineer.

LANCASHIRE.—July 20th.—For the supply of 2,000 tons of granite setts, for the county council.—Mr. W. H. Schofield, county surveyor, Preston.

EALING.—July 21st.—For making up Borleau-road (portion), Golf-road, Station-road (portion), Waldegrave-road, Woodstock-avenue, Weymouth-avenue (portion), and Meadvale-road (portion), for the corporation.—Mr. W. R. Hicks, borough engineer.

ACTON.—July 21st.—For making up back passages, [illegible]

BARNOLDSWICK.—July 21st.—For pitching, paving, and kerbing, for the urban district council.—Mr. W. Ellis, engineer and surveyor

GELLYGAER.—July 21st.—For works of road improvement, for the urban district council.—Mr. F. Read, engineer and surveyor.

HALIFAX.—July 21st.—For work of road widening, for the corporation.—Mr. J. Lord, borough engineer.

BRANDON.—July 21st.—For making up certain streets, for the urban district council.—Mr. G. G. Donkin, surveyor.

SALFORD.—July 21st.—For paving, flagging and sewering, for the corporation.—Borough Engineer.

LANCHESTER.—July 22nd.—For making up certain streets, for the rural district council.—Mr. W. Cumming, highway surveyor.

LEIGH.—July 22nd.—For the supply of 1,700 tons of granite setts, for the corporation.—Mr. T. Hunter, borough engineer.

GLASGOW.—July 22nd.—For paving work, for the corporation.—Mr. W. Greig, superintendent of cleansing [illegible]

BIRMINGHAM.—July 22nd.—For the recon[illegible] mittee.—Mr. H. E. Stilgoe, city engineer.

ROCHDALE.—July 22nd.—For making up certain streets, for the corporation.—Borough Surveyor.

OLDHAM. [illegible] Borough S[illegible]

RICHMOND. [illegible] July 23rd. [illegible] North-road, for the corporation.—Mr. J. H. Brierley, borough surveyor.

STOCKPORT. [illegible] July 24th.—For making up certain roads, for the corporation.—Mr. J. Atkinson, borough surveyor.

GREENOCK.—July 25th.—For paving with granite [illegible] Master of Works.

BRAINTREE.—July 27th.—For the supply of 700 [illegible] Mr. H. H. N[illegible]

WINCHESTER. July 27th. For [illegible] macadamising work, for the corporation.—Borough Engineer.

WIGAN. July 27th. For [illegible] Chapel-lane and Poolstock with granite setts, for the corporation.—Mr. A. T. Gooseman, borough engineer, King-street.

WATFORD.—July 28th.—For making up certain roads, for the urban district council.—Mr. D. Waterhouse, engineer.

WOODFORD.—July 28th.—For the supply of broken granite and hire of steam rollers and scarifiers, for the urban district council.—Mr. W. Farrington, surveyor.

BIRMINGHAM. July 28th. For paving on High-street, Harborne (creosoted deal), Ryland-street, Ledsam-street, and Booth-street (granite setts and creosoted deal), and concrete foundations for Durax paving in Harborne-road, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

EDMONTON.—July 28th.—For providing and laying creosoted deal blocks, for the urban district council. —Mr. C. Brown, engineer.

COLCHESTER.—July 29th.—For laying about 10,000 sq. yds. of wood-block paving, partly on cement concrete foundations, including the removal of existing granite sett paving and macadam, for the corporation.—Mr. Harold Collins, borough engineer and surveyor.

LLANTRISANT. July 29th. For making up certain streets, for the rural district council.—Mr. T. Saunders, surveyor, School-street, Pontyclun, Glam.

PERTHSHIRE.—July 31st.—For the reconstruction of 25 miles of road through Glen Dochart, Glen Falloch and Strath Fillan, in the parish of Killin, for the Western District Committee.—Mr. W. L. Gibson, engineer and surveyor, Post Office Buildings, Dunblane, Perthshire.

BLACKROCK.—August 1st.—For the construction of a road, for the urban district council.—The Clerk.

HASTINGS.—August 3rd.—For the supply of 2,000 tons of broken granite, for the corporation.—Mr. P. H. Palmer, borough engineer.

ALFRETON.—August 10th.—Offers for a steam roller built by Messrs. Aveling & Porter in 1893.—Mr. R. [illegible] Wood, surveyor.

Sanitary.

ROMFORD.—July 18th.—For the construction of stoneware pipe sewers, and road work, for the rural district council.—Mr. W. J. Grant, surveyor, 16A South-street, Romford.

TILBURY.—July 18th.—For the removal of house refuse, for the urban district council.—Mr. T. A. Capron, clerk.

ROTHERHAM.—July 20th.—For laying stoneware pipe sewer, for the rural district council.—Mr. B. Hey, engineer, Imperial Buildings.

BRADFORD. July 20th. For the construction of a circular outfall sewer in tunnel, for the corporation.—Mr. J. Watson, Town Hall.

FAREHAM.—July 20th.—For the provision and laying of about 465 yds. of 12-in. sea outfall pipe, about 87 yds. of 3-in. pipe, concrete cradle blocks, concrete piling and driving, laying about 8,000 yds. of 12-in., 9-in., and smaller stoneware pipe sewers, about 900 yds. of 12-in., 7-in. and 6-in. cast-iron pipe sewers, construction of manholes, ventilation and flushing chambers, storage tank, and other works, for the rural district council.—Mr. W. Cobbett, engineer, West-street, Fareham, Hants.

HALTWHISTLE.—July 20th.—For the construction of sewage disposal works, for the rural district council.—Mr. J. F. Parker, engineer, Post Office Chambers, Newcastle-on-Tyne.

DONCASTER.—July 21st.—For scavenging work, for the rural district council.—Mr. G. W. Cowley, sanitary inspector, 7 St. George-gate, Doncaster.

MACCLESFIELD.—July 21st.—For work of sewerage, for the corporation.—Mr. S. C. Baggott, borough surveyor.

SEDGEFIELD.—July 22nd.—For the removal of house refuse, for the rural district council.—Mr. J. W. [illegible], inspector, Blackgate, Coxhoe.

DENTON.—July 22nd.—For the construction of about 1,000 yds. of 12-in. stoneware pipe sewer, partly in tunnel, and other works connected therewith, for the urban district council.—The Surveyor, Town Hall, Denton.

HORSFORTH.—July 25th.—For sewage works extension, for the urban district council.—Mr. H. Raven, engineer.

SOUTHGATE.—July 28th.—For laying surface-water sewers, for the urban district council.—Mr. C. G. Lawson, surveyor.

CANNOCK.—July 29th.—For the supply, delivery, and placing in filters of about 3,400 cub. yds. of cold-blast furnace slag, and 1,845 cub. yds. of granite filling, washed and screened to the required size at the sewage farm, for the urban district council.—Mr. Robert Blanchard, engineer and surveyor, Council Offices.

AXMINSTER.—July 29th.—For the construction of sewage disposal works, for the rural district council.—Messrs. Phillott & George, engineers, 31 Promenade, Cheltenham.

PORTHCAWL.—July 31st.—For the construction of certain lengths of stoneware and iron sewers of 9, 12, and 21 in. diameter, and concrete tube sewers of 30 in. in diameter, manholes, flushing tanks, and sea outfall, for the urban district council.—Messrs. J. Taylor & Sons, Caxton House, Westminster, S.W.

CHIPPING NORTON.—July 31st.—For the provision and laying of about 3,600 yds. of earthenware pipe sewers, manholes, and ventilating columns, also extension to existing outfall works, construction of percolating filters, separating tanks, humus tanks, and other appurtenant works, for the corporation.—Messrs. Berrington, Son & Wattney, Prudential Chambers, Lichfield-street, Wolverhampton, and 28 Victoria-street, Westminster, S.W.

EARBY. July 31st. For sewage disposal works extension, for the urban district council.—Mr. J. E. Aldersley, engineer and surveyor.

PORTSLADE.—August 4th.—For the construction of main surface-water sewer and outfall works, for the urban district council.—Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, S.W.

RUNCORN. August 7th. For the construction of sewers and sewage disposal works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

RUNCORN. August 7th.—For laying steel tube, cast-iron and earthenware pipe sewers, flushing tanks, storm overflows, manholes, ventilators, sedimentation tanks, percolating filter (including reinforced concrete construction on the Kahn system), engine and pump-house, pump well, and other appurtenant works, for the rural district council. Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

FLEET.—August 13th.—For the construction of about 16 miles of stoneware and cast-iron sewers, brick, concrete, and cast-iron manholes, flushing tanks, ventilating shafts and columns, cast-iron rising mains, air mains, engines, compressors, ejectors, and other works incidental thereto, for the urban district council.—Mr. T. J. Moss-Flower, engineer, 28 Victoria-street, Westminster, S.W.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Miscellaneous.

HOWDEN. July 24th. For the construction of a 12-in. trial boring in the parish of South Newbold, and for testing the yield of water therefrom, for the rural district council.—Mr. Percy Griffith, 20 Victoria-street, Westminster, S.W.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
: Provisionally accepted

ASHFORD.—For the supply of broken granite and granite chippings, for the urban district council.—Mr. W. Terrill, surveyor:—

	Per cubic yards. s. d.	s. d.
British Macadams, Limited, London	14 5	14 1
Croft Granite Company, Leicester	14 5	13 [illegible]
Enderby Granite Company, Leicester	14 0	12 8
Fay Brothers, Greenwich	16 0	15 0
Hudsons, Limited, Brighton *	13 3	12 5
Hudsons, Limited, Brighton	13 3	11 9
A. & F. Marnelle, London	14 7	14 6
Mowlem & Co., London	15 0	14 3
A. Martin & Co., London	13 8	13 4
Penlee and St. Ives Stone Company, Bristol	13 4	12 1
Road Maintenance Company, London	14 5	14 1
Rowe & Mitchell, London	14 3	13 9
Tilbury Contracting Company, London	15 3	15 3

CHAPELL-EN-LE-FRITH.—For the providing and laying of about 1,300 yds. of 3-in. cast-iron pipes for the extension of water mains, and other appurtenant works, in the parish of Bamford, for the rural district council.—Messrs. Brady & Partington, engineers, Chapel-en-le-Frith:—

W. Jowett, Prescot	£390
F. Marland, Ashton-under-Lyne	366
T. Kearsley & Son, Leigh, Lancs	320
Staveley Coal and Iron Company, Limited, Chesterfield *	310

FELTWELL.—For the erection and maintenance of a pumping station, for the Commissioners of the Feltwell New Fen Drainage.—Mr. E. J. Silcock, engineer, Westminster and Leeds.

Wade & Sykes, Leeds	£4,650
J. W. Collins, Downham Market	3,305
F. W. Ashby, Downham Market	3,160
Bardell Brothers, King's Lynn	2,956
R. Shanks & Sons, Chatteris, Cambs *	2,727

HEMEL HEMPSTEAD.—For the erection of an isolation hospital, for the Joint Hospital Board:—

H. Peppiatt & Cooper, High Holborn	£7,118
A. Timberlake, King's Langley	6,682
Clarke Brothers, Watford	6,530
J. Mead, Chesham	6,374
R. Schooley, Finsbury	6,359
C. Brightman & Sons, Watford	6,273
T. Biggs, Northampton	5,997
G. Henson & Sons, Wellingborough	5,990
C. Miskin & Sons, St. Albans *	5,989

HOVE.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor:—
J. Parsons & Sons, Hove, £247.

LONDON.—For the erection of the new Sessions House at Newington, S.E., for the London County Council:

WORK TO BE EXECUTED IN TWENTY-ONE MONTHS.

Higgs & Hill, Limited	£110,899
Holland & Hannen & Cubitts, Limited	108,888
W. Downs	107,789
Holloway Brothers (London), Limited	105,800
W. Lawrence & Sons	105,440
J. Carmichael	104,507
Holliday & Greenwood	103,590
C. Wall, Limited	103,000
Foster & Dicksee, Limited	102,688
G. Godson & Sons	101,797
Wilson, Lovatt & Sons, Limited (twenty-four working months)	101,095
Leslie & Co., Limited	100,667
C. E. Wallis & Sons	99,784
W. E. Blake & Co., Fulham †	98,980

WORK TO BE EXECUTED IN SIXTEEN MONTHS.

Holland & Hannen & Cubitts, Limited	£113,288
G. Godson & Sons	111,797
W. Lawrence & Sons	109,000
W. Downs	108,569
J. Carmichael	104,507
W. E. Blake & Co.	103,980
Leslie & Co., Limited	103,735

WORK TO BE EXECUTED IN TWELVE MONTHS.

Leslie & Co., Limited	£111,735
W. Downs	110,225
W. E. Blake & Co.	108,980
J. Carmichael	105,507

PONTYPRIDD.—For the execution of private street work, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor:—

	Jenkins-street.	Lane at rear of Tram-road.	Landraw-road.
S. J. Hill, Pontypridd *	£373	£180	—
W. Jones, Llanbradach	498	245	£574
D. Jones, Pontypridd	479	247	531
A. G. Collins & Co., Barry	502	241	623
W. J. Davies, Hopkinstown	399	193	516*
J. Harry, Cardiff	435	239	552
H. Murray, Pontypridd	461	232	618

PORTSMOUTH.—For the erection of a school, for the Education Committee.—Mr. C. C. Vernon-Inkpen, architect, Portsmouth:—

Wakeham Brothers, Plymouth	£21,972
W. W. Evans, Southsea	21,086
J. Croad, Portsmouth	21,075
J. Tanner, Southsea	21,052
S. Salter, Portsmouth	21,021
E. & A. Springings, Portsmouth	20,958
J. Harding, Southsea	20,848
J. Crockerell, Portsmouth	20,245
F. J. Privett, Portsmouth †	19,669

NEWPORT (Mon.).—For private street works, for the corporation.—Mr. H. Tremelling, borough engineer:—
A. S. Morgan, Lanvair-road, £299.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JULY.

18.—Junior Institution of Engineers: Visit to Tunnel Portland Cement Works, Purfleet.
18.—Somerset Surveyors' Association: Meeting at Williton, 2 p.m.
18.—Institution of Municipal and County Engineers: Meeting at Hackney.
18.—Institution of Municipal Engineers: Northern District Meeting at Alnwick.
25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

AUGUST.

15-17.—Institution of Municipal Engineers: Visit to Hunstanton.

SEPTEMBER.

19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

COUNTY BOROUGH OF ROTHERHAM.
BOROUGH AND WATERWORKS ENGINEER'S DEPARTMENT.

The Rotherham Corporation invite applications for the position of Assistant to the Waterworks Engineer.

Salary £120, rising by £5 per year to £140.

Applications, on Forms to be supplied, and accompanied by copies of three recent testimonials, must be received by the undersigned not later than July 28th, 1914.

Canvassing, directly or indirectly, will be deemed a disqualification.

CHAS. L. DES FORGES,
Town Clerk.

Town Hall, Rotherham.
July 13, 1914. (1,790)

BOROUGH OF CHEPPING WYCOMBE.

The Town Council invite applications for the appointment of Clerk in the Borough Surveyor's Department.

Candidates must be shorthand writers and typists, and have a good knowledge of accounts as kept in a Municipal Surveyor's Office. Salary £78 per annum.

Applications, stating age and qualifications, with not more than three recent testimonials, endorsed "Surveyor's Clerk," must be delivered to the undersigned not later than noon on Wednesday, the 22nd July, 1914.

Canvassing will be considered a disqualification.

T. J. RUSHBROOKE,
Borough Engineer and Surveyor.

25 Easton-street,
High Wycombe.
July 6, 1914. (1,774)

COUNTY BOROUGH OF SWANSEA.
APPOINTMENT OF BOROUGH ESTATE AGENT AND VALUER.

The Corporation of Swansea invite applications for the appointment of Borough Estate Agent and Valuer.

Salary £400 per annum, payable monthly.

Applications, stating age, qualifications, and experience, accompanied by copies of not more than three recent testimonials (which will not be returned), endorsed "Estate Agent," to be sent to me the undersigned (from whom particulars of the duties of the office can be obtained) not later than 12 o'clock noon on Tuesday, the 21st July, 1914.

Canvassing, either directly or indirectly, will be a disqualification.

H. LANG COATH,
Town Clerk.

Guildhall,
Swansea.
July 7, 1914. (1,771)

MADRAS CORPORATION, INDIA.

[illegible] ENGINEER.

[illegible]

period.

[illegible] the appointment at any time by three months [illegible]

The Officer appointed will be allowed ordinary [illegible] will be granted on the termination of the appointment, subject to the satisfactory service according to the conditions of the agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but for not more than three months at a time.

The applicant must not be more than 35 years old and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the application, which must reach the undersigned not later than Thursday, 30th July. They will be sent out to Madras, where the final selection will be made by the President of the Corporation.

The President reserves the right of rejecting all applications without giving reasons.

The Officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of the application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed [illegible]

[illegible]
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster, London, S.W.
July 7, 1914. [illegible]

ST. ANNES-ON-THE-SEA URBAN DISTRICT COUNCIL.

The Urban District Council of St. Annes-on-the-Sea invite applications for the appointment of Engineer and Surveyor to the Council. The person appointed [illegible] carrying out all duties of an Engineer and Surveyor under the Public Health Acts and all other Acts incorporated therewith, and must devote the whole of his time to the duties of the office.

[illegible]

Pupil will be allowed.

Applications, stating qualifications, age and par- [illegible] two references, to be sent to the under-signed, endorsed "Surveyor," not later than the 27th day of July instant.

Canvassing, either directly or indirectly, will be deemed a disqualification.

(By order of the Council)
T. BRADLEY,
Clerk.

[illegible]
St. Annes-on-the-Sea.
July 10, 1914. (1,783)

COUNTY OF CORNWALL.

[illegible] OF COUNTY SURVEYOR [illegible]

Applicants must be not less than 30 or more than [illegible]

The Council attach importance to applicants with [illegible]

Offices and Staff will be provided, and all reason- [illegible]

[illegible] be during the pleasure of the [illegible] &c., to be in- [illegible]

Canvassing, either directly or indirectly, will be [illegible] and printed copies of their applications and testimonials to the members of the Highways Committee, a list of whom can be obtained on application.

The person appointed will be required to devote the whole of his time to the duties of his office.

Applications must be sent in to the undersigned not later than the 31st instant.

Further particulars of the terms of the appointment can be obtained from the undersigned.

CHRISTOPHER L. COWLARD,
Clerk of the County Council.

Bodmin.
July 3, 1914. (1,765)

BOROUGH OF WORKINGTON.

The Corporation of Workington require the services of an experienced Road Foreman, and are prepared to receive applications from persons whose age must not exceed 45, and who must have a thorough experience in modern road construction and maintenance, including tar and bituminous bound roads, sewer construction, and all other duties which generally appertain to the office.

He must also be thoroughly experienced in the supervising and organisation of manual and team labour.

Preference will be given to candidates who have held a similar position under a Local Authority, and who are also able to cycle.

The salary will be £2 5s. per week.

Applications, in candidate's own handwriting, stating age, experience, present and previous appointments, accompanied by three recent testimonials, to be sent to the undersigned, endorsed "Road Foreman," by Tuesday, the 21st instant.

Canvassing will disqualify any candidate.

H. BOWMAN WILLIAMS,
Borough Engineer and Surveyor.

Town Hall, Workington.
July 8, 1914. (1,778)

THE FROME URBAN DISTRICT COUNCIL [illegible] TEMPORARY ASSISTANT.

The Frome Urban District Council invite Applica- [illegible] the appointment of a Temporary Assistant in the Surveyor's Office.

[illegible] and neat Draughtsmen, capable of making Surveys, and have a thorough [illegible] Surveyor's Department.

Preference will be given to Candidates holding the [illegible] Municipal and County Engineers. [illegible]

Applications, in the Candidate's own handwriting, endorsed "Surveyor's Assistant," stating age, qualifications, and particulars of experience, and accompanied by copies of three recent testimonials, must be received by the undersigned not later than the 25th of July, 1914.

Canvassing will be deemed a disqualification.

F. W. JONES, ASSOC.M.INST.C.E.,
Engineer and Surveyor.

The Public Offices,
Frome.
July 14, 1914. (1,792)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. JULY 24, 1914. No. 1,175.

Minutes of Proceedings.

Road Tolls, Road Taxes, and Heavy Motor Vehicles.

A very critical period has been reached in the development of the highway system and of road locomotion in this country. On the one hand there is the acceptance by a Parliamentary Committee of the principle of the toll-gate on single lengths of road forming parts of the highway system of the country; and on the other hand there is the announcement, reported on another page, that a Select Committee is to be appointed "to consider the whole position with regard to motor omnibuses and trolly vehicles running in the neighbourhood of great corporations." Should these services pay for the upkeep of the roads, and if so, how much? That is the question to be considered, involving, it may be pointed out, the further questions What is the "neighbourhood," and what is a "great corporation"? Now, in actual fact, motor omnibuses, motor coaches, and other heavy public service and touring vehicles inflict more wear and tear upon the roads in places remote from great corporations than they do in and near the towns, and it seems therefore that it would be much better to consider the contributions of these services as a part of a general system of vehicle taxation. We already have the simple and convenient petrol tax, and, if more money is needed, a general and graduated wheel tax, or axle-weight tax, could be imposed, and could be collected much more easily and cheaply than a tax based upon the demarcation of areas which are in many cases rapidly changing in character. Considering, moreover, that tramways and wire-bus systems involve an interference with the highway and a fixity of route, neither of which exists in the case of free vehicles, it seems only reasonable that the latter class should be treated on its merits, and as though the fixed route systems did not exist. Surely, it is worth while to preserve the truly highway character of our road system by imposing whatever taxes may be necessary upon the vehicles or their mileages, without reference to areas or routes. That London motor omnibuses should pay, say, ¾d. per mile while running on the Great West Road, and nothing per mile in London itself, nor in the open country to the west of this road, seems, on the face of it, to be an illogical and inconvenient arrangement. It is likely, too, to lead to the making of attempts to utilise other roads which will be less fit to stand such traffic, and in the end the country will be forced to regard the vehicle itself or its mileage, or both, as providing the only possible basis for taxation. The payment by the Imperial Government of half the cost of great main roads, and a quarter the cost of another class of roads, will wipe out at one stroke the case for taxation to meet heavy local wear and tear caused by public service vehicles. Tolls and local omnibus taxes would be very unpopular, for it is obvious that a 2-ton limousine motor car conveying one rich banker to and fro between the City and his country house in Surrey or Hertfordshire would wear the roads to a much greater extent per passenger than would the ordinary public service vehicle in the suburbs.

It may be pointed out that on Monday last the House of Lords passed the third reading of the Middlesex Bill; but the Paymaster-General, in suggesting that the matter of the toll should be "hung up until the question could be considered as a whole," seems to have implied that the toll on this road would not be regarded as permanently fixed unless it should turn out to be in accord with arrangements made on a wider basis [illegible] generally. As regards the Great West Road project, we may refer our readers to THE SURVEYOR of May 15th, pp. 793-794, noting that the estimate of Imperial contributions should have been stated as about £2,500,000, not £4,500,000. The considerations set forth in these pages seem to point to the conclusion that the toll-gate system should not be revived on English highways, and we believe that the objections to direct local taxes are quite as strong, especially in view of the fact that indirect taxation may be quite as effective [illegible]

* *

Sewage Purification by Aëration: Manchester Experiments.

So much interest has been [illegible] and so many hopes [illegible] by various statements that have been made from time to time with regard to the possibilities of purifying sewage by aëration, that we much regret that we are unable to print the whole of the paper upon "Experiments on the Oxidation of Sewage Without the Aid of Filters," which was read by Messrs. Edward Ardern M.SC., and William T. Lockett, M.SC., in April last at a meeting of the Manchester Section of the Society of Chemical Industry. On another page we reproduce the conclusions arrived at as a result of the investigations made; the full text of the paper, with tables, appeared in the Journal of the society for May 30th, a copy of a reprint of which has just come to hand. In previous references to similar

experiments we have examined these investigations and the possibilities of future developments in sewage purification in what appears to us to be the right direction, especially as the results, so far, indicate a great advance in the solution of the problem of sludge disposal. At the same time, we have pointed out that the next step is to ascertain the cost of the process when carried out on a large scale under ordinary working conditions. It was quite natural that the authors of the paper in question, which dealt with laboratory experiments, should hesitate to give any definite figures as to the probable cost of the system on a large scale; but in the course of the discussion there were brought forward some particulars which may be interesting to those who have been watching the experiments with interest.

In the first place, it would appear that satisfactory results have been obtained with six hours' aëration, and allowing a similar period for manipulation, it would appear to be possible to use a set of tanks twice in each twenty-four hours, which means that the capacity of the necessary tanks for dealing with the dry-weather flow should be equal to one-half the daily dry-weather volume. If allowance is made for dealing with three times the dry-weather flow as sewage proper, then the total tank capacity needed would be one and a-half times the dry-weather flow. Special arrangements will, of course, be required to ensure the thorough mixing of the air with the sewage in such large tanks, and some special means will have to be devised for aërating the sludge and keeping the "activated sludge" in intimate contact with the sewage as appears to be necessary. Then, with regard to the volume of air required, it was stated by Mr. Ardern in his reply to the discussion that in the case of the experiments they used about one-fifth of a cubic foot of air per square foot of tank area per minute; but that in practice very much less than this would suffice. If we take 50 per cent of the above-mentioned quantity, and assume the depth of sewage in the tank to be 6 ft., we find that each 1,000 gallons of sewage would require 2·7 cub. ft. of air per minute, or 972 cub. ft. for the six hours during which aëration is taking place. If we have understood the figures aright and our calculations are correct, each 1,000 gallons of sewage would require about 1,000 cub. ft. of air, delivered at the rate of 2·7 cub. ft. per minute. If we now apply these figures to a concrete case with a daily flow of 1,000,000 gallons, we find that 1,000,000 cub. ft. of air would be required in twelve hours, so that the necessary air-compressing plant would have to be capable of delivering 14,000 cub. ft. of air per minute. No information was given as to the pressure under which the air should be delivered, so that we are unable to estimate the horse power required, and although the pressure will probably not be great, the delivery of such a comparatively large volume of air will necessitate the use of air-compressors of considerable size.

These observations are not made in any captious spirit, but simply to indicate, from the information at present available, the chief points which must be considered in any further investigations which may be made on a practical scale. Nothing but praise is due to Messrs. Ardern and Lockett for the admirable manner in which their laboratory experiments have been arranged and carried out, and for the extremely interesting paper in which the results of their work have been made public.

* * *

Organisation.

The recognition of the great importance of scientific organisation is a very striking feature in the modern business world, and inasmuch as the chief spending department of a local authority must be run on business lines if the interests of the ratepayers are to be properly guarded, it will be seen that the power to organise is an essential qualification for the municipal engineer. There can be little wonder, therefore, that the paper on "The Organisation of a Municipal Engineer's Department," which was read at Cheltenham by Mr. Edward Willis, the engineer and surveyor to the Chiswick Urban District Council, was received with special interest. At the outset Mr. Willis very aptly defined good organisation as the efficient and harmonious working of each section of every department, with no friction or wasted time where two sections overlap or become interwoven. Considerations of space preclude us from dealing in any detail with each of the eleven sub-departments which were suggested. The paper, which we reproduce practically in full elsewhere, was of so thorough and practical a character, however, that we advise our readers carefully to peruse it. Due stress was, of course, laid upon the necessity for *esprit de corps*, in order to insure that perfect harmony in working from which alone the most beneficial results can be obtained, but Mr. Willis recommended in addition that every assistant should continue his studies, and always strive to learn and know more than is necessary to enable him merely to carry out his immediate duties. This is a very sound principle, and one which should be carefully noted by every young assistant who desires to rise in his profession. The discussion which followed upon the reading of the paper partly turned upon the responsibility of a chief for the welfare of his staff, one member remarking that every surveyor "ought to assist his assistants." The principle is a right one, and is, we believe, generally acted upon. The knowledge on the part of an assistant that he has the sympathy of his chief is the greatest possible incentive to loyalty and hard work. Another point of discussion, raised by Mr. J. S. Brodie, was as to whether certain of the sub-departments with which the paper dealt were properly included in the scope of the legitimate duties of a municipal engineer. The departments specially mentioned were refuse collection and disposal, sanitary administration, fire protection, and stores and depots. Mr. Brodie's criticism, however, did not receive any general endorsement, and at the most merely amounted to a suggestion that the author of the paper had erred on the side of thoroughness.

* * *

The Euston-road Building Line Appeal.

Questions of more or less difficulty have from time to time arisen in connection with the subject of the building line in London streets. Sec. 75 of the old Metropolis Management Act of 1862 prohibited the erection of buildings beyond the general line of buildings—if the distance of that line did not exceed 50 ft. from the highway—without the consent of the Metropolitan Board of Works. The London Building Act, 1894, repealed this section, but re-enacted it with the substitution of the consent of the London County Council for that of the defunct board, and with the important addition that the general line of buildings should, if required, be defined by the superintending architect, by a certificate to be issued within a month after the application therefor. It is to be observed that this provision does not empower the architect to prescribe the general line, but only to define it. The line exists independently of his certificate, and the latter is only evidence of where the line is. Moreover it has been held that in determining the general line the architect ought to have regard to the frontage of houses previously existing, and

which may be rebuilt, as well as to those still standing, also that he should determine the extent of the space along which the line is to be laid down. An appeal from the architect's decision lies to the Tribunal of Appeal constituted by the Act, and a further appeal lies from that Tribunal to the High Court on questions of law.

The recent case of *Clark and Others v. London County Council* was concerned with the building line of a certain section of the north side of the Eastern road, and presented some peculiar features. This road, it appears, was laid out in the year 1756 under an Act which provided that no building should be erected on new foundations within 50 ft. of the highway. The original buildings were accordingly set back to the 50-ft. line, with forecourts. But subsequently, and prior to the passing of the Act of 1862, another row of houses of varying heights was erected on some of the forecourts on new foundations, 11 ft. only from the kerb, in contravention of the earlier Act. In 1867 the owners of these then unlawful buildings memorialised the Board of Works with a view to legalising the 11-ft. line, and the board, on the recommendation of the late Mr. Vulliamy, not only authorised the continuance of the buildings in question, but also consented to future buildings being built up to the same line. In 1909 an owner was about to erect a building up to the 11-ft. line, when it was objected to, and the superintending architect, being required to define the building line, certified it as being the old 50-ft. line. The Tribunal of Appeal confirmed his certificate. The Divisional Court were divided in opinion, Mr. Justice Lush being against upholding the architect's certificate, and Mr. Justice Ridley in favour of it. The Court of Appeal agreed with Mr. Justice Lush. They held that the council could not override what had been authorised and approved in 1867 by the Board of Works as the general line of building frontage, and that that was now the general line of building for the portion of the road in question. The owner's appeal was therefore allowed.

* * *

Smoke Abatement.

Among the nuisances which may be abated summarily under the Public Health Act, 1875, is "any chimney, not being the chimney of a private dwelling-house, sending forth black smoke in such quantity as to be a nuisance." From a legal point of view, therefore, the domestic fireplace is above suspicion, but, as was shown by Mr. J. C. Dawes in a paper on "Air Pollution by Coal Smoke," which he read at the Royal Sanitary Institute Congress at Blackpool, hygienically it is the arch-offender. This is a fact, however, which has only been fully recognised in recent years, for the phraseology of the Act of 1875 is reproduced in the Public Health (London) Act which was passed sixteen years later. So far as factory smoke is concerned much good work in the direction of abatement has already been accomplished. Indeed, manufacturers themselves have been convinced of the economic wastefulness of the production of large quantities of black smoke. In the case of the ordinary householder, however, there is a strong sentiment to be overcome before any substantial improvement is achieved; but now that it can be said with truth that the domestic hearth is doing much more harm than the mill or factory furnace, it is surely time that some organised effort should be made for the education of public opinion on this important subject. The practical result of the presence of smoke in the atmosphere may easily be seen in time of fog. As Mr. Dawes observed, it is only necessary to contrast the clean cloud which envelops a country district with the poisonous pall which hangs over a town, in order to see the difference which exists between the ordinary standard of the purity of the air in the two places. Moreover, the harmful effect of the obscuring of the sun's rays is itself a serious matter, for the sun is the greatest and cheapest disinfector which is possible. Mr. Dawes' paper dealt thoughtfully with a most important question which ought to be kept constantly in the forefront in hygienic propagandist work.

* * *

New Examinations.

The decision of the council of the Institution of Municipal and County Engineers to hold special certificate examinations in town planning and county and highway engineering respectively is thoroughly justified by the great importance which has been assumed by these subjects in recent years. The regulations and syllabuses which were issued recently show that the new examinations are not intended in any way to supplant or interfere with the old "Testamur" examination. They are meant rather to afford candidates a chance of demonstrating their special knowledge of these subjects, and there is little doubt that the opportunity is one which many will be eager to seize. The first examination will be held in October next. The syllabus in town planning comprises a general knowledge of Part II. of the Housing, Town Planning, &c., Act, 1909, and the Local Government Board regulations thereunder, the suitability of an area for town planning, natural features, buildings, building lines, streets, and the provision of parks, open spaces, playing fields, and allotments. The examination in county and highway engineering is equally comprehensive, and in each case the written papers will be supplemented not only by a *viva voce* examination, but also by practical field work. In addition, all candidates must produce drawings certified by the engineer under whom they are working, or by some other responsible person approved by the council of the institution, as having been prepared solely by the candidate himself. The secretary of the institution will be pleased to answer any inquiries on the matter.

* * *

The Cole Testimonial.

The decision to mark the retirement of Mr. Thomas Cole, ASSOC.M.INST.C.E., from the office of secretary to the Institution of Municipal and County Engineers by the presentation of a testimonial is one which will meet with approval in all quarters. It would be impossible to estimate the share which Mr. Cole has taken in evolving from very small beginnings the large and flourishing organisation which now exists, and the debt which is owing to him, both by the institution and the profession, is one which can never be discharged. Those who know Mr. Cole best are confident that he will value the testimonial, not only in proportion to its value, but in direct ratio to its representative character. In the words of the circular which has been issued, it will gladden the heart of the late secretary in his retirement if he can be informed that every member of the institution has contributed within the very modest limits which have been fixed. Mr. Cole's energies are by no means yet exhausted, and, as we were able to announce in our last issue, in addition to acting as consulting secretary to the institution he is entering into a partnership with a view to private practice. His many friends will unite in wishing him every success in his new venture, and in hoping that his advice and experience will be available for many years to come in the interests of the institution to which he is so much attached.

Fourth Annual Report of the Road Board.

IMPORTANT DEVELOPMENTS: COUNTY SCHEMES: GRANTS IN GREATER LONDON: CONDITIONS IN SCOTLAND AND IRELAND.

The report of the Road Board for the financial year ended March 31, 1914 [illegible] to which we referred last week, is a very interesting document, setting forth the policy of the board with regard to different areas and different classes of roads, and [illegible] the conditions and purposes of the grants and loans allotted in the preceding twelve months. Very important observations are made with regard to conditions in Ireland, in Scotland, and in the London area, and the board's [illegible] with regard to these areas are set forth in very plain terms. Comprehensive schemes are in hand for the improvement of roads [illegible] in counties and districts, and the board [illegible] being prepared beforehand with schemes for works to be undertaken in periods of trade depression.

	£
Grants made and indicated up to 31st March, 1914	3,829,105
Balance available at 31st March, 1914 for grants on assumption that receipts to 30th September, 1915 may be anticipated...	2,170,895

PURPOSES OF GRANTS AND LOANS.

The purposes for which grants and loans have been made are shown in tables, separately, for the three parts of the United Kingdom, but it will be sufficient to reproduce here the table for the kingdom as a whole, the more important of the figures for England and Wales, and for Scotland and Ireland, being separately stated below.

Classification.	From May 6th to 31st March 1913.		During year ended 31st March 1914.		Total to 31st March 1914.	
	Grants.	Loans.	Grants.	Loans.	Grants.	Loans.
	£	£	£	£	£	£
Improvement of road crusts	913,400	105,170	987,174	283,292	1,900,574	388,462
Road widenings and improvement of curves, gradients, and corners	88,988	1,200	76,186	9,656	164,194	10,956
Road diversions	24,299	—	29,076	3,664	53,275	3,664
Reconstruction and improvement of bridges ...	14,477	—	22,415	280	66,892	280
New roads and bridges ...	89,578	—	22,920	—	85,498	—
Total ...	1,130,722	106,470	1,137,711	296,892	2,268,433	403,362
Less loans repaid ...	—	4,767	—	27,337	—	32,104
	1,130,722	101,703	1,137,711	269,555	2,268,433	371,258
Total grants and loans, less repayments	£1,232,425		£1,407,266		£2,639,691	

The receipts from motor spirit duties amounted to £789,703, an increase of £105,393 over the year 1913; from carriage licence duties £605,248 (increase £117,353); interest and profit on investments and loans, £86,447 (increase £29,649); total, £1,481,398 (increase £252,395). Administrative expenses amounted to £15,690; payments under grants to £639,713; under loans, £296,892. The gross total of payments was £952,295, or, deducting £27,336, loans repaid, a nett total of £924,959. An adjustment of these figures, crediting outstanding sums, shows that the motor spirit duties really yielded £757,334 in 1914, an increase of 7·8 per cent; and the carriage licence duties £570,815, an increase of 15·6 per cent.

In view of the intervals between the dates of "indicating" loans and grants, and the dates at which the money is actually paid over, the board feels justified in indicating grants and loans to an amount of £414,025 in excess of nett income.

AMOUNT AVAILABLE FOR GRANTS AND LOANS.

The board considers that they can in making grants anticipate income for a period of at least eighteen months. They are therefore at the present time making grants on the assumption that they can safely indicate a sum of about £2,200,000 in addition to the total grants made up to March 31, 1914. The following statement has been compiled to show how that figure has been arrived at:—

	£
Receipts to the fund from May, 1910 to 31st March, 1914	4,810,818
Estimated receipts from 31st March, 1914 to September, 1915 ...	2,270,000
	7,080,818
Less Administrative expenses to 30th September, 1915—say ...	80,818
	7,000,000
Set aside for works to be carried out in a period of trade depression and meanwhile used for other loans for road improvement. (Loans to the extent of £1,384,707 have been redeemed, but the additional amount can be provided out of floating balances of grants) ...	1,000,000
	6,000,000

ENGLAND AND WALES.

Classification.	During year ended 31st March, 1914.		Total to 31st March, 1914.	
	Grants.	Loans.	Grants.	Loans.
	£	£	£	£
Improvement of road crusts	865,839	254,654	1,566,832	350,390
Road widenings and improvement of curves, gradients and corners ...	68,179	9,156	149,650	10,456
Road diversions	27,076	3,404	43,001	3,404
Reconstruction and improvement of bridges	19,713	—	57,898	—
Total	1,003,727	267,214	1,901,779	364,250
Total grants and loans less repayments	£1,245,747		£2,266,067	

SCOTLAND.

	£	£	£	£
Improvement of road crusts	61,593	21,764	191,778	27,477
Road widenings and improvement of curves, gradients and corners	7,597	500	12,088	500
Road diversions	1,240	260	8,674	260
Reconstruction and improvement of bridges	2,642	280	8,844	280
Total ...	72,638	22,804	221,384	28,517
Total grants and loans, less repayments	£94,308		£248,717	

IRELAND.

	£	£	£	£
Improvement of road crusts	59,736	6,874	141,964	10,595
Road widenings and improvement of curves, gradients and corners ...	800	—	2,456	—
Road diversions	700	—	700	—
Reconstruction and improvement of bridges	60	—	150	—
Total	61,296	6,874	145,270	10,595
Total grants and loans, less repayments	£67,212		£164,907	

In England and Wales there was an expenditure of £22,920 on new roads and bridges, bringing the total under this head to £83,498; but there has been no expenditure on new roads and bridges in Scotland, nor in Ireland.

As regards grants and loans indicated, but not yet formally made, amounting to £2,542,017, detailed classification is not possible; but, apart from the sum of £400,000 for the proposed Brentford loop road, the bulk of this sum will be expended on the improvement of road crusts.

With respect to the expenditure on road crusts, paragraph 16 of the report may be quoted in full, as follows:—

"The experience hitherto gained by the board as to the views and requirements of highway authorities, and as to the condition and needs of roads throughout the country, has confirmed them in the opinion expressed in previous annual reports, that the most pressing and the most universal need is the strengthening and improvement of the crusts (which include consolidation as well as surface coatings) of existing roads. In a few districts important roads are so narrow that they need widening before any other improvement is attempted, and these cases are specially dealt with as applications are submitted to the board, but the general need of most rural and inter-urban roads is that they should be made as rapidly as possible fit to carry the increasing motor traffic satisfactorily to the road user, and without undue deterioration of the road surface. This is the view almost universally expressed by the representatives of highway authorities in charge of rural and inter-urban roads. Consequently, the board have concentrated their efforts towards assisting the improvement of road crusts, and after the important roads requiring this kind of improvement have been dealt with, they will be able to assist more freely than they have hitherto done other kinds of road improvement."

With reference to reconstruction, it is pointed out that the amount of such work which can be undertaken is limited by the difficulty of providing for the initial cost. The board have therefore encouraged several highway authorities to undertake comprehensive schemes, with the help of grants, and loans free of interest. The above table gives particulars of schemes in one Welsh and thirteen English counties.

Since the average cost per mile is between £1,800 and £1,900, it is clear that the work of reconstruction is to be carried out very thoroughly. These schemes enable the highway authorities to obtain suitable plant, to make favourable arrangements for the supply of materials, and to economise by concentrating work on a single straightforward job. As regards widths, the board, "although fully favour as much land as possible being secured between fences for footpaths or grass margins, do not encourage the widening of the metalled portion of carriageways through rural areas beyond 18 ft., as they are of opinion that this width is generally adequate for traffic purposes except in the immediate vicinity of towns."

MAIN AND DISTRICT ROADS.

Every application made by a district council, whether by a direct application or through a county council, is considered by the board; but the main roads usually include a large proportion of the mileage of the most important roads in a county, and a grant to a county council relieves all district ratepayers in the county, while a grant to a district council benefits only the ratepayers of the particular district.

"Unless, therefore, the district work possesses some feature of general public importance which entitles it to special consideration, it does not appear to the board that, either in the interest of public traffic or in the interests of the ratepayers, the funds available should, except in special cases, be diverted from the more important main roads to roads of lesser public importance.

"In those cases where a district road of real importance has not been mained in consequence of some definite limitation of policy on the part of a county council, or has, owing to changes in the character or volume of the traffic, become of such importance that it should be declared a main road, and the county council are prepared to 'main' it, the board always endeavour to give favourable consideration to applications for advances for the purpose of enabling the district council to carry out the works required to be done as a condition precedent to the maining of such roads."

As an example of this policy, the road from Lewes to Newhaven is to be improved at a cost of £33,619, the Road Board making a grant of £17,619, and the East Sussex County Council and the district council making each a contribution of £8,000, and this road will be declared a main road.

The total length of district roads which are being improved by means of advances, and which will be maintained as main roads by the county councils, is 74 miles, of which 26 miles are in England and 48 miles in Wales.

GRANTS IN GREATER LONDON.

Since, under the conditions of the London area, it is impossible for the board to make grants to the county council for the improvement of main roads, so that the benefit may be shared by all the ratepayers, as in other counties, the board has decided to make an allotment of funds in the area of the Metropolitan Police District, or Greater London.

The board have provisionally allocated, for the purposes of works in Greater London, a sum of £960,000 out of the total amount of £6,000,000 shown to be available for grants up to the present time.

County.	Mileage included in the scheme.	Total expenditure proposed.	Grant.	Loan.	Total initial expenditure of county council.	Periods over which repayments of loan are spread.
		£	£	£	£	
Buckinghamshire	8	27,207	14,000	6,200	13,207	4 years.
Cambridge	21	28,693	15,773	10,000	12,920	5 years.
Cheshire	23	37,247	—	30,000	37,247	5 years.
Durham	31½	55,003	15,800	9,400	39,203	5 years.
Hereford ..	22	37,430	13,963	19,000	23,467	up to 6 years.
Middlesex . .	5	30,668	5,431	23,700	25,237	7 years.
Montgomery .	15	23,942	6,500	15,000	17,442	6 years.
Northampton . .	14½	60,090	10,000	25,000	41,090	5 years.
Oxford	63	109,324	56,321	31,450	53,003	3 to 6 years.
Soke of Peterborough .	5½	14,985	7,185	7,800	7,800	6 years.
Hampshire	49	78,500	27,000	38,425	51,500	4 to 5 years.
East Sussex .	20	54,678	22,278	30,000	32,400	4 to 6 years.
West Sussex	29	41,041	16,000	25,000	25,041	7 years.
Warwickshire	40	90,950	46,675	23,410	44,275	6 years.
	567½	689,758	265,926	294,585	423,832	

This provisional allocation has been dealt with as follows:—

	£	£
Allocation as above		960,000
Less Grants made and indicated		
Construction of new Brentford Loop Road	400,000	
County boroughs in Greater London	55,000	
Metropolitan borough councils	127,000	
Highway authorities in extra London ...	220,000	
		802,000
Balance now available for grants by anticipating income up to 30th September, 1915		158,000

The above-mentioned provisional allocation has been made in the ratio of population as between the area of Greater London and the rest of the United Kingdom. The board consider that the population ratio is the most favourable basis for London which they can legitimately adopt at the present time. It gives London, owing to its dense population, a considerable advantage as compared with districts having a lower population density in relation to the roads which they are obliged to maintain.

As regards the claims which are made for London on the ground that consideration should be given to the large amount collected in London from motor licence duties and the consumption of motor spirit, the report is explicit and convincing. "The general public interest must be considered. . . . It is easy

[illegible] the metropolitan area."

The board have therefore decided to allot not more [illegible] on the basis of population ratio."

SCOTLAND.

"Scottish authorities contend that the roads in their districts, which are used by through motor traffic, would not call for exceptional expenditure if it were only a question of maintaining the roads for [illegible] To admit this contention would ignore the obligation which rests on the authorities to maintain the roads in [illegible] through or local, but the board recognise that, while substantially the whole cost of maintenance has to be borne by local authorities, there is sound justification for the attitude adopted, and in dealing with cases of the character referred to they have endeavoured as far as practicable to meet the special circumstances of the districts by contributing so far as their funds would permit exceptionally large proportions of the total expenditure on road crust work in respect of which applications have been made to [illegible] having regard to local circumstances."

IRELAND.

In Ireland there is a serious administrative and financial difficulty in that only about a quarter of the total of duties on motor vehicles is collected. The amount of duty collected in the year ended March 31, 1911, was £19,057, and in the year ended March 31, 1913, only £16,567, estimated as a little over 25 per cent of the proper total. The board, in making grants, feel compelled to take into consideration the steps taken in each county to collect the duties.

"Progress in road development work in Ireland is seriously handicapped by the existing system of administration under which county councils, although the maintenance of all rural roads rests with them, are unable to incur any expenditure, even on roads of the first importance, until such expenditure has been proposed and approved by rural district councils.

"It appears to the board to be very desirable that this system should be altered by legislation at an early date so as to secure that the highway authority responsible for the execution of maintenance work should be able to determine the work to be done and the expenditure to be incurred. It would be essential as a preliminary to such legislation that the roads should be classified. . . ."

WORKS IN PERIODS OF TRADE DEPRESSION.

It is pointed out in the report that it is essential that works intended to be carried out in periods of trade depression should be settled in advance. Otherwise delay would occur just when progress with work and expenditure became desirable. Very few schemes have yet been suggested, and the board is considering what steps can be taken to encourage and facilitate proposals. The [illegible] character as to afford the maximum employment of labour. Ordinary street widenings in urban areas would not usually be suitable, but the board is prepared to consider such schemes when the highway authorities have acquired, or are willing to acquire, the necessary property, and seek the help of the board towards proposed expenditure on labour and materials.

Change of Address. Messrs. S. H. Morden & Co., Limited, announce that they have removed from 11 Tothill-street to Morden House, Westminster, S.W.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not a sign of the advanced thinking of the present age when a sanitary inspector quotes Walt Whitman in a paper on "Housing"? What would some of the sanitary inspectors of forty years ago have thought of this?

* * * *

What is this we hear about some special electrical treatment at Liverpool which renders milk perfectly immune from dangerous bacilli? How does it differ from ordinary sterilised milk, and is it free from the objections there are to such milk?

* * * *

Is there any truth in the contention raised by some local authorities that the conversion of privies, pail closets, &c., into water-closets tends to throw an extra burden upon the sewage disposal works? Is there not the other argument that the collection of the refuse from these out-of-date "conveniences" is saved? And should not this saving be more than a set-off against any small addition to the sewage disposal works?

* * * *

What has been the experience in this country of wind-engine water pumping installations? Have there been any large number of such installations for public water supplies, and how many have been "scrapped" as being useless? Is not the wind a too uncertain factor to be relied on, even if ample provision for storage is secured?

* * * *

Will not the proposed imposition of ½d. per mile run by motor omnibuses on the proposed Great West Road out of London defeat the very object for which this road is to be made? Will not the omnibuses naturally prefer to still use the "free" road through Hammersmith, and the congestion of the traffic be as bad as ever? What do the shopkeepers in the "free" streets say to the proposal?

* * * *

What will be the outcome of Dr. Gilbert Fowler's and Mr. Mumford's experiments on the oxidation of sewage without the aid of filters? If the process can be applied successfully on a large scale, will it not be a mere question of £ *s. d.* as to whether it will not supersede the present tank plus filtration methods in vogue? Is not the paper given by Messrs. Ardern and Lockett to the Manchester Section of the Society of Chemical Industry on this subject well worthy of our most careful consideration?

* * * *

When will the Road Improvement Association let us know the result of the 100 guinea Horseshoe competition? Have they found a shoe which will not damage the surface of our roads and at the same time keep a "horse on his legs" under all conditions of gradients, slipperiness, and so forth?

* * * *

Will the gas fire ever be as popular as the coal fire? Although it may be more economical, clean, convenient, and give sufficient heat, can it ever replace the friendly and cheerful, if often varying and exasperating, coal fire? Is there not a depressing sameness about a gas fire in a sitting-room?

* * * *

Is it not rather a shock to find that the Camberwell Borough Council still retain a "refuse" siding close to the Southwark Infirmary, although they have repeatedly been urged to do away with it? Is it a matter of surprise to find that the proximity of this refuse siding produces dangers, dust and flies, and that there are several cases of enteritis among children in the infirmary which are alleged to have broken out through this cause?

* * * *

Was it not on the introduction of Hancock's steam carriage on the roads that the wiseacres of those days succeeded in squashing the attempt to introduce mechanical traction on the roads by leaving deep, new metal on the surface, and by other equally barbarous methods? Does not history repeat itself when we find that Parliament is trying similar methods of "squashing" the motor omnibus? Is it not a fact that ever since the introduction of mechanical traffic the law has endeavoured to put obstacles in the way of progress? And is it not nearly always the case that law and science are antagonistic?

Institution of Municipal and County Engineers.

MEETING AT HACKNEY.

A meeting of the Institution of Municipal and County Engineers was held in the Metropolitan Division at the Town Hall, Hackney, on Saturday afternoon, when there were present: Mr. J. S. Pickering, presiding in the chair, and Messrs. J. Potter Barber (Hornsey), E. J. Batten (Stratford), L. M. Bell (Penang), J. Birch (East Ham), A. W. Caine (Stoke Newington), W. Nisbet Blair (St. Pancras), C. A. Clews (Derby), J. W. Cockrill (Great Yarmouth), T. Cole (Westminster, consulting secretary), R. Collins (Enfield), W. R. Collins (Enfield), A. C. Coates (Islington), (Hornsey), A. E. Darby (Bethnal Green), E. J. Elford (Southend-on-Sea), A. Gladwell (Eton), A. D. Greatorex (West Bromwich), A. J. Green (Hampstead), W. Harpur (Cardiff), F. Harris (Tonbridge), P. T. Harrison (Chelmsford), T. W. A. Hill (Battersea), L. R. Impey (Ipswich), P. G. Killick (Finsbury), H. Leadbeater (West Ham), T. N. McRea (Hampstead), F. E. Marsh (Singapore), F. Massie (Wakefield), A. P. Piggott (Stoke Newington), W. H. Prescott (Tottenham), J. W. D. Robinson (Westminster, secretary), N. Scorgie (Hackney, hon. district secretary), G. M. Seels (New Malden), J. P. Spencer (Tynemouth), H. E. Stilgoe (Birmingham), H. D. Strange (Dorchester), W. Stubbs (Blackburn), W. H. Taylor (Aylesbury), R. J. Thomas (Buckinghamshire), H. T. Wakelam (Middlesex), H. A. White (Battersea), J. Williams (Hampstead) and O. E. Winter (Hampstead).

The members were received in the council chamber by the Mayor of Hackney (Councillor Charles Winkley, J.P.), who said that in welcoming the representatives of the institution he was welcoming men of business, men who had very great responsibilities thrust upon them, and whose advice members of local authorities had to rely on to guide them in the discharge of their duties. Councillors had to look to them continually for their advice, and unless they were able to give good, sound advice on every occasion when it was required, it stood to reason difficulties would be experienced. Feeling the responsibility that rested upon them, the members of the institution made a practice of visiting different parts of the country with the object of exchanging ideas, and of seeing what was being done in other districts, utilising the information they obtained for the benefit of their own towns. It was a great pleasure to him to welcome the institution to Hackney, and he was sure that under the guidance of their engineer, Mr. Scorgie, they could rely on not going away without seeing much that would be of interest to them. Apart from the electricity and destructor works which they were to visit later, he might refer to the condition of their roads. Hackney was a very large borough and had considerably over 100 miles of streets, and speaking as a motorist he could say there were few boroughs that could boast of such road surfaces as they had. He trusted their visit would be of advantage, and at the same time of very great pleasure to them.

The PRESIDENT expressed appreciation of the presence of his Worship, and returned thanks for the very kind welcome which had been accorded to the members. Their esteemed friend Mr. Scorgie had, with the assistance of Mr. Robinson, the borough electrical engineer, and Mr. Bryan, chief engineer to the Metropolitan Water Board—who was one of their members—arranged a programme from which he was sure they would gain a very great deal of information that would not only be beneficial to themselves, but profitable to the authorities whom they represented. As mayor of that important borough, he was sure his Worship would recognise the advantages to the community of an institution such as theirs. As the responsibilities of local authorities increased year by year, so the work of the municipal and county engineer gained in importance and became more exacting; and it was owing to the educational facilities afforded by their institution that they were better able to discharge the duties that devolved upon them as public officials. The official who stayed at home with the object of gaining experience in his own particular town was not likely to carry out his duties as efficiently as the engineer who rubbed shoulders with his *confrères*; and it was therefore very desirable in the interests of the public that local authorities should give every facility and encouragement to their officials to attend such meetings as that. The mayor's very kindly welcome that day showed them that his Worship was in sympathy with their objects, and they were exceedingly obliged to him.

The MAYOR in acknowledgment, remarked that he considered it only a part of his duties to give facilities for such gatherings as that, realising that the more they were able to rub shoulders, exchange ideas, and criticise each other's work, the better it was for the authorities they represented.

ALTERATIONS IN ARTICLES OF ASSOCIATION.

The ordinary meeting was suspended at this point for the holding of a special meeting.

The SECRETARY read the minutes of the special general meeting held at Cheltenham on June 24th last, when resolutions as to alterations in the Articles of Association were passed.

The PRESIDENT formally moved the confirmation of the minutes, Mr. A. D. GREATOREX (West Bromwich) seconded, and it was agreed to.

The ordinary meeting of the institution was then resumed and consideration given to the subjoined paper:—

NOTES ON THE REFUSE DESTRUCTOR WORKS AND ELECTRICITY UNDERTAKING OF THE BOROUGH OF HACKNEY, N.E.

By LEONARD L. ROBINSON, M.I.E.E., M.I.MECH.E., Borough Electrical Engineer.

The electricity works were opened on October 31, 1901, and since then a general supply of direct current at 240 and 480 volts has been given for all purposes except traction.

The Hackney Council's area of supply consists of the whole of the Borough of Hackney, as defined by the Hackney Electric Lighting Order, 1893. The area is 3,299 acres, the population about 230,000, and the rateable value £1,250,000.

DESTRUCTOR UNDERTAKING.

The author's department has nothing to do with the collection of the refuse, this work being done by contractors under the supervision of the medical officer of health.

The contractors' vans are weighed as they enter the works, the contents are then tipped into the hoppers of elevators, and the vans are reweighed as they leave, so that an accurate record is kept of the weight of refuse received, and the figures thus obtained are used for works statistics as well as forming the basis upon which the contractors' accounts are paid.

There are three buckets and rake elevators, each driven by a 7½ b.h.p. series wound motor, which are each capable of raising from 10 to 11 tons of refuse per hour. The author's experience of these elevators has not been at all favourable. They are very expensive to maintain, liable to serious breaks down, and their capacity seriously limits the rate at which vans can be unloaded at the rush times, which occur between 11 a.m. and 1 p.m., and 5 p.m. and 7 p.m.

The total amount of refuse to be dealt with in a year is about 39,000 tons, but there are times when over short periods it is desirable to unload vans at a much greater rate than 20 tons per hour, to which the elevators limit the working, as it is generally necessary to have one of the three sets of plant out of commission for repairs.

Storage bins are provided over the cells with accommodation which is supposed to be sufficient for a day's supply of refuse; but the character of the refuse varies greatly, and when it is bulky the storage accommodation is too small, and much labour and time is lost in trimming down, in order to make the most of the accommodation. From the storage bins the refuse has to be raked into the charging doors of the furnaces, and this, again, is a laborious job owing to the varying and often binding nature of the refuse. The whole of the elevating and storing plant is a forcible example of what ought not to be done, and the author greatly favours the skip system of collecting, storing, and cell charging, a very excellent example of which is installed at Rotterdam.

The destructor proper consists of three units of plant, each as follows: Elevator and storage bins, as described above. Four furnace cells, two of which

[illegible] keep the dampers tight, and therefore much valuable heat is lost to the chimney.

[illegible] of refuse burned per twenty-four hours is 15 to 16 tons per cell with a 3-in. water gauge draught at the fans. Three 15 b.h.p. electrically driven fans are [illegible] for the work. Each of the three boilers is a Babcock & Wilcox [illegible] and 10 ft. in diameter. It serves both the destructor and the old coal-fired boiler-house. A lining of fire-brick with air space is carried up inside about 80 ft. There is a Green's economiser of 258 tubes at the [illegible] boilers and the coal-fired boilers in the electricity works. It would be much wiser to have a small economiser behind each boiler, but the economiser as at present arranged doubtless serves to some extent to use much of the heat which escapes into the by-pass flues.

The clinker is taken from the cells in steel wheel barrows and wheeled to the cooling yard, whence it is carted at a cost of 1s. 4d. per ton. It will be observed that the destructor is an old one, and far from up to date; but it is by no means lacking in interest, as it is a good object lesson as to what should not be repeated in future designs, and from its faults the author possesses valuable data as to the kind of lay-out that should be adopted when the time comes to build a new destructor.

The following data is taken from the author's report for one year ended March 31, 1913, that being the eleventh completed year in which the destructor had been in operation.

During the year 39,019 tons of refuse have been destroyed. The largest quantity received in any one day was 212 tons, and the smallest quantity 53 tons, the average daily quantity being 128 tons. From the total quantity of refuse delivered 269 tons of tins, scrap metal, &c., and 17,203 tons of clinker, flue dust, and fine ash were removed.

The following is an analysis of the dust destructor [illegible]

[illegible] of the attachment of balance between the [illegible] and electricity departments. The loan charges on the destructor capital are borne by the [illegible] and a [illegible] for the charges [illegible] that capital. For the purpose of [illegible] the value to the heat supplied, the [illegible] has been determined by experiment extending over a week, and at present stands at 3·51 lb. This figure is multiplied by the number of units generated during the year, and the resulting [illegible] at the average price paid for coal [illegible] the year. From this sum the actual total price paid for coal is deducted, and the balance represents the credit due to the public health department for the heat supplied.

It is doubtful whether the system is really a satisfactory one, but it is extremely difficult to find a better system. However, it probably saddles the electricity department with a heavier boiler-house cost than it would have to meet if it were independent of a destructor. For instance, the boiler repairs which are undertaken by the electricity department are heavier than with coal-fired boilers, and the economiser, which would last for many years if dealing only with the flue gases from coal fires, requires complete renewal every five or six years when subject to the corrosive action of destructor gases. Then, again, the steaming of the destructor is variable, and the electricity department cannot rely upon getting most steam at the time they want it most. Probably, if the value were ascertained, as set out above, and subjected to a deduction of 20 to 30 per cent, the result would more nearly approximate the true value of the services rendered.

ELECTRICITY UNDERTAKING.

The electricity works adjoin the destructor works, and, as explained in the last section of this description, both works share the same chimney.

Coal is obtained by barging from ships in the Thames up the river Lea, which also supplies the condensing water. Make-up water to the hot well and water for domestic purposes is secured from the London chalk by means of an 8-in. bore artesian well 460 ft. deep. A compressed-air lift pump is installed, and can supply about 6,000 gallons per hour.

The original boiler-house contains eight Babcock & Wilcox land type boilers. Four have each a heating surface of 2,852 sq. ft., with integral superheaters of 389 sq. ft. two have each a heating surface of 4,020 sq. ft. with integral superheaters of 452 sq. ft., and two have each a heating surface of 4,226 sq. ft., with integral superheaters of 660 sq ft.

The working pressure is 200 lb. per square inch, and the draught and the natural draught of the chimney 200 ft. high. . . .

Item.	1911/1912.	1912/1913.	Cost per ton. 1911/12.	Cost per ton. 1912/13.	Rise.	Fall.
	£ s. d.	£ s. d.	d.	d.	d.	d.
Oil, waste, water and stores	52 14 11	55 11 3	0·48	0·34	—	0·04
Electricity, &c.	504 12 7	623 8 6	3·01	3·83	0·22	
Wages of workmen and sick pay	3,270 6 7	3,245 0 6	20·05	20·20	0·15	
Repairs and maintenance	602 14 3	727 19 1	3·67	4·48	1·41	
Clinker disposal	1,014 15 11	1,060 4 7	6·20	6·39	0·19	
Rents, rates and taxes	111 8 9	423 14 5	2·52	2·61	0·09	
Management expenses, &c.	210 10 8	265 17 7	1·30	1·64	0·34	
Total working costs	6,767 3 7	6,420 15 11	37·13	39·49	2·36	

In addition to the foregoing expenditure for the year 1912-13, the repayment of principal and interest amounted to £2,732 19s. 11d.

The nett expenditure upon the destructor revenue account, after crediting the value of the heat transferred to the electricity undertaking, £2,293 13s. 9d., and sundry receipts, £240 0s. 5d., was £6,620 1s. 8d., which is at the rate of 3s. 4·7d. per ton.

The capital cost of the works was:—

	Total expenditure to 31st March, 1913.
	£ s. d.
1. Lands, including [illegible]	2,769 17 0
2. To buildings	16,6[illegible]9 3 1
3. To plant	19,6[illegible]3 11 7
	£39,082 11 8

[Here follows a statement of refuse received and by-products removed during a period of eleven years.]

It may be of interest to say a word on the vexed

The feed pumps are situated in a room at one end of the boiler-house over the hot well. There are three Weir steam pumps and one Hayward Tyler motor-driven turbine pump, the latter being the most popular and doing the greater part of the work. There are also two small electrically driven three-throw Worthington pumps. The condensed steam is freed of oil by aluminia sulphate in a home-made plant, and reused with the addition of make-up water from the artesian well. The water is soft, and the boilers only require opening up once a year.

In the old engine-room there are six sets of triple-expansion condensing engines, two of 300-kw. capacity by Willans & Robinson and Holmes, two of 600-kw. capacity by Bellis & Morcom and Holmes, one of 1,500-kw. capacity by Bellis & Morcom and Westinghouse, one of 1,500-kw. capacity by Bellis & Morcom and Dick Kerr.

All the condensers are of the surface-condensing type, with motor-driven circulating water and

Edwards' type air pumps. The condensing water is taken from the River Lea through two 18-in. pipes through a suitable screen in chamber, and discharged on a 27-in. pipe some distance down stream. Although the river is canalised, no trouble has been experienced with silting, because there is a large traffic on the river, consequently over 3,000,000 tons per day are used by the locks, and thus a frequent change of water is provided.

Although the requirements [illegible] cannot compare with the economy of turbines, they have done good service, and during the first one year of the history the undertaking held the proud position of having the lowest cost of generating and distributing in the Metropolis, and is now second to Stepney and Poplar, which have modern turbine installed, upon which the bulk of their load is placed. . . .

EXTENSIONS.

Some few years ago it was realised that the original works had been laid down on altogether too conservative lines, that larger generating sets must be installed, and that to continue the generation and transmission at low-tension direct current would not be economical. The author therefore prepared a scheme involving the ultimate expenditure of some £200,000. The general outline of the new scheme provides for the generation of three-phase alternating current at 6,000 to 6,500 volts at 50 periods on the three-phase system. Part of this supply will be converted at the Millfields-road works, for which purpose a 1,500-kw. La Cour converter is being installed, and as the old engines become obsolete they will be scrapped, and their places taken by synchronous motors driving the existing dynamos, which will be good for many years to come. The three-phase supply will also be transmitted to substations in the area of supply, and converted to direct-current at the supply pressure, or, in cases of very large supplies, the raw mains may be looped into consumers' premises to give supplies of three-phase current.

The new building is built on to the old works, and is a steel-frame structure with concrete panels, roofed with reinforced glass and asbestos tiles.

The turbine-room follows the line of the old engine-room, and the boiler-house runs at right-angles to the turbine-room. Parallel with the turbine room are a basement for cables and air filters, ground-floor gallery for mess-room, and E.H.T. switchgear, and first-floor gallery for engineers' offices and control board.

The turbine-room is of sufficient size to accommodate one 3,000-kw. turbo-alternator, and two 5,000-kw. turbo-alternators. The 3,000-kw. set is in course of erection, and the first 5,000-kw. set is on order.

The boiler-house is being erected in two sections, the first of which is nearing completion; the total accommodation for eight 30,000-lb. to 40,000-lb. per hour boilers, the first two of which are in course of erection. Above the boilers there is accommodation for large economisers and ejector-type induced draught plant. At the northern extremity of the site a steel-frame concrete building is being erected for housing the circulating water pumps, and adjacent thereto is the screening chamber for the water intake. Above the boiler-house there is a large coal bunker in four compartments, having a total capacity of about 1,300 tons, which is fed by a duplicate telpher plant with a capacity of 40 tons per hour. . . .

OUTPUT AND FINANCE.

The present output of the works is about 8,584,246 units sold per annum, and the maximum load last year was 5,254-kw. The load factor is about 18 per cent to 21 per cent. The capital at March 31, 1914, was £411,207. The surplus revenue in each year, after providing for interest and redemption, has been: 1903, £2,254; 1904, £5,546; 1905, £5,478; 1906, £7,094; 1907, £2,886; 1908, £1,412; 1909, £1,718; 1910, £6,124; 1911, £7,708; 1912, £9,519; 1913, £8,882; 1914, £7,024.

The author trusts that he has managed to touch upon the chief points of interest in the Hackney undertaking. These short notes cannot be claimed to be fully descriptive, but they have had to be prepared at short notice, and the author will be glad to answer inquiries which members of your institution may care to make.

DISCUSSION OF MR. ROBINSON'S PAPER.

Mr. E. J. ELFORD (Southend-on-Sea), in proposing a vote of thanks to Mr. Robinson, asked if the latter could give some further particulars in regard to the home-made plant used for separating oil from condensed steam. It might be interesting to some of them. There was only one other point he would like to mention. Mr. Robinson spoke of the turbine pump as being one of the most popular in connection with the old plant, yet in the new plant they had adopted the reciprocating type. Was there any special reason for that?

Mr. A. GLADWELL (Essex), second, said he understood nothing about electricity, but he thought the thanks of the meeting were due to Mr. Robinson for taking the trouble to compile the notes, as he called them—descriptive of the Hackney electricity and refuse destructor works, which ought to prove exceedingly useful to them when they inspected these undertakings.

Mr. R. COLLINS (Enfield), referring to the author's statement of refuse received and by-products removed over a period of eleven years, inquired whether Mr. Robinson could give the increase in population given year.

Mr. W. HARPUR (Cardiff) observed that the cost per ton of refuse burnt appeared to be rather high, and asked whether any explanation of that could be given.

Mr. W. NISBET BLAIR (St. Pancras) said he had also been looking at these figures. He could not see how one could make 20·2d. per ton for labour in destroying refuse. The total cost in his district was 1s. 4d. There was a figure for electricity included. He took it that referred to power supplied to the works; but was there no credit given for heat supplied by the destructor?

The PRESIDENT (Mr. J. S. Pickering) expressed his personal thanks to Mr. Robinson for coming in at a late hour to write the paper, which would be exceedingly useful to them. He thought they could take a lesson from his remarks, inasmuch as he had given them examples of what ought not to be done. He took it from that that he was not responsible for the works he had described, but many of them were rather inclined to hide bad work. The cost of the refuse destruction seemed to be exceedingly high, and he thought Mr. Robinson would agree that with a more modern destructor he would be able to reduce it. Mr. Blair had stated that the cost at St. Pancras was 1s. 6d., but at Cheltenham they rarely exceeded 1s. per ton. Everything depended on circumstances, however. He had been struck with the high percentage of clinker—45 per cent—which showed that the combustion was not very thorough. One generally got about 25 per cent.

The vote of thanks was passed.

Mr. ROBINSON, in replying, stated that the oil-eliminating apparatus to which Mr. Elford had referred was originally an old Goodman's softener for dealing with very hard water they received from the town main. After a time they decided to bore their own well, and they were lucky enough to strike water which was fairly good for boilers without any treatment. Formerly the water was treated by coke filters, but that became too troublesome an operation, so he moved up the old tanks of the Goodman filter, and arranged that the water coming in was pumped up into a set of horizontal turbine, which, in revolving, discharged a large portion of its water direct to the reaction tank, at the same time a large portion was trapped off and went into the reagent tank. The reagent they used was alumina sulphate. As to the question why, if the old turbine pump was so popular, he did not adopt that class of pump in the new works, at the time the new works were designed the turbine pump had only just been put to work, and on starting gave a deal of trouble. Eventually it had to go back to the makers and was entirely reconstructed. It was now giving perfect satisfaction. With regard to the increase of population, he had not got those figures, and he did not think that any were available. He believed, however, the population of Hackney was now more or less stationary. The cost per ton of destroying refuse was admittedly high, but the same thing applied to all the London stations. The labour question there—especially in connection with that work—was extremely troublesome, and no doubt a great deal was added to the cost by the elevators and the amount of trimming. Out of 20·2d. per ton for destruction, he did not think more than 1s. or 1s. 2d. could be allocated to the destruction of the refuse. The rest was due to handling by bad methods. The charge for electricity was fairly high, for the elevators consumed a lot of energy, which was supplied at ¾d. per unit. That was fairly low, and they would observe that there was a credit of £2,293 for the power obtained from the burning of the refuse.

[illegible]

[illegible]

LEA BRIDGE PUMPING STATION.

[illegible] the year 1829 an Act of Parliament was obtained to [illegible] the intake on the river Lea between Lea Bridge Mills, in the parish of St. [illegible] of St. Mary's, Stratford, Bow. The company purchased the Lea Bridge Mills and the Hackney waterworks, and made their intake on the Hackney side of the river Lea, and constructed a reservoir also in the parish of Hackney, and a channel was cut parallel to the River Lea Navigation from Lea Bridge to supply water to the then existing reservoirs at Old Ford, the intake being thus above all tidal influence. In the [illegible] Act of Parliament was obtained enabling the company to carry their intakes further up the river, to abandon the intake at Lea Bridge, [illegible] at Walthamstow and [illegible] at Lea Bridge on the Essex side of the river, and to convert the reservoir on the Hackney side of the river into filter-beds. At the same time the open channels for conveying water to Old Ford were abandoned, and a large cast-iron main laid from Lea Bridge to Old Ford to conduct the filtered water to the pumping plant at the latter station.

The Lea Bridge works cover an area of about 60 acres, the filter-beds, twenty-five in number, nearly 25 acres. There are two wells in the chalk, with a total length of heading of about 2 miles, and numerous boreholes have been sunk below the bottom of the headings.

The pumping plant consists of four vertical triple-expansion engines capable of lifting 52,000,000 gallons daily; three Cornish, 29,000,000 gallons; two compound rotary pumping engines, 8,900,000 gallons; one compound horizontal, 3,000,000 gallons; four turbines, 2,750,000 gallons; triple - expansion Worthington, 10,000,000 gallons; in addition, two horizontal engines for pumping water from the wells to the surface of the ground.

THE KING GEORGE'S RESERVOIR.

This is situated partly in Middlesex and partly in Essex, the nearest railway station being Enfield Lock (Great Eastern Railway). The top water area of this [illegible] 425 acres, and when full it contains 3,073 [illegible] gallons.

[illegible] practically from [illegible] the [illegible] and carry [illegible] and con[illegible] to [illegible] at the present time. The extreme length of the reservoir at water line is 1 mile 1,190 yds. The main banks of the reservoir contain about 2,400,000 cub. yds. of earth, of which 253,000 cub. yds. are puddle. The inner banks are lined with about 105,000 sq. yds. of concrete and brick paving.

A brick channel takes the "stored" water in a southerly direction to Chingford Mill, where it joins former channels connected to the chain of reservoirs commencing near Higham Hill.

All the other reservoirs are filled by gravitation with the exception of the Banbury and Lockwood reservoirs, which can only be filled to half their capacity in this manner, and water is pumped into them from a pumping station ½ mile south of Chingford Mill by three vertical compound pumping engines, attached to which are centrifugal pumps each capable of delivering 40,000,000 gallons per day into the reservoirs.

The Humphrey pumps have created unusual interest by reason of the fact that the plant is unique in waterworks construction. There are four pumps with a capacity of 40,000,000 gallons per day each, and one pump of 20,000,000 gallons capacity.

Each pump may be looked upon as a gas engine and pump combined, but without piston, crosshead, connecting rod, crankshaft, flywheel, bearings, gearing or stuffing boxes.

The action of the pump can be best understood by picturing a horizontal pipe connected by two bends at its ends with a vertical closed-top combustion chamber and an open top water tower respectively. The parts thus connected are nearly full of water, forming a heavy mass or column, which is made to oscillate under the action of the explosion. This oscillation is quite free, and occurs in such a manner that the movement of water causes the intake of a fresh combustible mixture, the compression of the mixture, the explosion and expansion which give the power stroke, and the exhaust of the burnt products. There are thus four primary movements of the water during each cycle, two being from the combustion chamber towards the tower, and two in the opposite direction. With the explosion of one pump 12 tons of water can be delivered into the reservoir.

On returning to Hackney the members were entertained to tea at the town hall by Mr. Scourge.

THE CHELTENHAM MEETING: GENERAL ENGINEERING SUBJECTS.

Mr. T. W. A. Hayward, vice-president, occupied the chair at the meeting at Cheltenham at which papers on General Engineering were taken, the first of these being the following:—

ORGANISATION OF A MUNICIPAL ENGINEER'S DEPARTMENT.

By Edward Willis, Assoc.M.Inst.C.E., F.S.I., Engineer and Surveyor to the Chiswick Urban District Council.

A thorough knowledge of organisation is most important to every engineer and surveyor having the management of any large town or city. It is also especially important to the young engineer appointed to a small district, since, although he will not have a large staff, it usually becomes necessary systematically to apportion his time and the time even of an assistant, pupil, or office boy, in such a manner that it can be utilised to the best advantage, and no portion of the necessary work appertaining to his department be neglected. . . .

In approaching the subject the author is met with the initial difficulty of the large variation in the work and responsibilities that the municipal engineer has to undertake, and he therefore proposes to deal briefly with only those duties which appertain to practically all appointments, while he will touch but very lightly upon those branches of the department which in large towns and cities are often placed under a separate head, but which in the smaller towns are usually added to the multifarious responsibilities placed upon and undertaken by the modern municipal engineer and surveyor.

Assuming that it is possible to create a new and complete department, the author would suggest the following main headings as the basis of its organisation:—

(*a*) Highways.
(*b*) Sewerage and sewage disposal works.
(*c*) Architectural work and supervision of buildings.
(*d*) Open spaces, parks, and pleasure grounds.
(*e*) Collection, removal, and disposal of house refuse.
(*f*) Sanitary administration, including public conveniences.
(*g*) Housing and town planning.
(*h*) Fire protection and extinction.
(*i*) Stores and depots.
(*j*) Miscellaneous.
(*k*) Establishment and staff.

The real essence of good organisation is the efficient and harmonious working of each section of all departments, with no friction or wasted time where two sections overlap or become interwoven. It is often in this overlapping between the separate sections of a department that most difficulties arise, loss of time is incurred, and individual character, ability, and tact are required to avoid friction.

In the creation of a department for a new small urban district it will probably be found that a very small staff will be allowed for a considerable amount of work, and this must result in several sections of the work being thrown upon one individual. If, however, the scheme is properly thought out and organised, its development will be automatic with the increased prosperity of the district, and no reorganisation, with its consequent possible upheavals and heartburnings, should ever become necessary.

It may be desirable before dealing with the above sub-headings to say a few words about the *personnel* of a staff.

In considering the smallest type of urban district,

it may be assumed the staff of the municipal engineer's department consists of one man, described in that most comprehensive word "The Surveyor." If he be conscientiously particularly generous he may have the advantage of a pupil and office boy. In this case but little organisation of staff will become necessary, but the organisation of work is a *sine qua non* if the administration of the district is to be efficient, and no harm can result from the scheme of such work being considered on broad, but definite, lines. In fact, the man that can grasp and deal with his work on broad lines is individually the most useful and best organised, provided he can likewise appreciate the importance of detail.

In the case, however, of an average municipal engineer's office in a town of, say, from 10,000 to 50,000 inhabitants, the circumstances are undoubtedly very different from the foregoing. The borough or district is probably already in a flourishing condition. It may be a quiet town, or it may be rapidly developing, the latter being probably the case in a town or suburb immediately adjoining the Metropolis or some of the great cities of the Empire, or in one which is being developed owing to the creation of a thriving industry within its boundaries.

Arrangements for expansion or possible decentralisation must therefore be anticipated and provided for; the individual abilities of each member of the staff should be appreciated to a nicety; the work in each section of the department should be defined and systematic; supervision should be accorded to all; absolute punctuality should be enforced, and integrity of thought as well as of deed should be fostered.

It might be here mentioned that some officials, while being absolutely above reproach in financial matters, still have not grasped that absolute integrity includes principles as well as actions, and the head of a department who can feel that not only integrity, but absolute loyalty to himself, permeates every member of his department is indeed fortunate, and such a knowledge is very helpful when the anxieties and worries of dealing with the numerous members of a large corporation weigh unduly heavily upon him.

It cannot be too much emphasised that a true *esprit de corps* should exist in every official, from the highest to the lowest, to ensure that perfect harmony in work which gives the most beneficial results to the council and ratepayers at large, and therefore any scheme which an engineer can advance to further this spirit will not only redound to his credit, but will probably add to his popularity, and make every individual member of the staff willingly throw his whole energies into his daily work, and not cavil or murmur when the exigencies of the public service necessitate hours of overtime, often without any thanks from his council.

HIGHWAYS.

As the construction and management of highways created the necessity for the surveyor and engineer, so it still ranks as one of the most important duties attaching to his department, and in the majority of districts it is organised as a separate section or sub-department.

The number of men engaged in maintenance and supervision must of necessity be governed by the area and the traffic throughout the district, but in practice the author advises that existing highways should be dealt with separately from the construction of new highways, since the latter largely consist of private street works and street improvements, and as such are subject to more detailed drawing and office work than the maintenance of existing roads.

The author is of opinion that even in a small district it is wise to make one man responsible for the administration of this sub-department, so that the entire maintenance of the existing roads and footpaths of a district are in his hands. He would then have charge of watering, scavenging, and repairs, including all team labour, manual labour and stores used upon public highways.

The question of improvements to existing highways and lighting in a small district is also left in this official's hands; but where the administration of a large town or city is to be dealt with, he is of opinion that the supervision of both improvements and lighting can be relegated to two other officials, who can personally report to him and specialise in their particular work.

Some engineers require personal reporting daily from the head of each sub-department, and this system has many advantages. At the same time the author has found in practice that there are equally great disadvantages, since in his own experience he has wasted hours in obtaining access to his chief to report sometimes comparatively trivial matters, and the procedure he has adopted in his own office is to obtain all reports in writing from the foregoing officials, who attend for interviews only when required.

Before concluding these observations on existing highways the author would like to emphasise the desirability of not only recording the materials and labour expended on repairs through the outgoing stores notes, but also the advisability of keeping abstracts, charts, and maps of the district showing exactly, from time to time, with the date attached, the amount of recoating carriageways or repaving footpaths carried out each year, and, as far as possible, the prime cost should be kept of all such work and reduced to a definite standard.

While advocating this the author must admit he has been unable, with a limited staff, to keep entirely to this standard of perfection; but he still advises the continuance of such a system as being ultimately conducive to both economy and efficiency.

With reference to watering, he has made a practice of attaching to each water van a small skeleton map of the beat, with positions of all road-watering posts shown thereon, as this tends to prevent the continual waste of time which will constantly occur where the number of road-watering posts is limited, and enables a better check to be maintained over the employees.

The question of scavenging with gangs or one-man beats is a vexed question, and in most districts too little money is spent on this important work. The quality of the labour also is often far from satisfactory, any man being considered fit to handle a broom. This is not the author's experience, as he has found that one man can often do twice the amount of work as another, and that such work is often more efficiently performed.

While the principle of pensions is not applicable to municipal labour in most districts, his council has endeavoured to reward the genuine workman who has laboured many years in the municipal service by relieving him of practically all his duties and paying him a nominal wage of 8s. per week (in effect a pension). This, in the case of a man over seventy years of age, can be supplemented by the Old Age Pension, and while the total amount is still small, the result, in most cases, prevents the man going into the workhouse, and thus relieves the district of aged labour, lessens Poor Law expenditure, and reduces the risk of accident.

The author considers new highways, especially private street works, can often in a large district be left in the hands of one capable assistant, with one or two pupils or draughtsmen to assist him, since uniformity in practice with private street work and apportionments is conducive to lessening of friction with speculating builders and small property owners.

Should the district have adopted the Private Street Works Act, the preparation of both provisional and final apportionments somewhat increases the clerical work in the engineer's department, and the author has found in practice that some of this can readily be carried out by a pupil or clerk when properly instructed.

It is desirable that provisional and final apportionment books be kept in lieu of loose sheets, and that such books should give full particulars of the ownership, frontage, estimate, final account and final apportionment, so that the past history of a private street can easily be traced without the necessity of unduly "wading through" numerous loose papers.

In some districts it is customary to have an absolutely standard specification and drawing for private street works; but this has not been the author's practice, since what may be desirable for one highway may be totally unsuitable for another, and in recent years under this heading the author has used from 9 in. to 21 in. of total formation, and the followed finished surfaces: 9 in. to 6 in. of flints; flints tar-painted and finished with granite chippings; tarred granite; tarred clinker finished with tarred limestone; Guernsey granite finished with Tarvia and granite chippings.

One other point before leaving this subject may be usefully mentioned. Where trees in streets are generally adopted, they may often be included in the private street works specification and estimate with advantage as well as grass margins, if the cost of maintenance can be reasonably afforded.

Complete records of renaming and renumbering must also be kept, as certificates are compulsorily being required when property changes hands.

SEWERAGE AND SEWAGE DISPOSAL WORKS.

In this sub-department the author suggests the separation of new and existing sewers from sewage disposal works; in fact, in all large towns and cities such a separation is a sine qua non, in many cases the sewage disposal being undertaken by a joint board, and dealt with either by a sea outfall or bacterial treatment.

The variations in the management of sewage disposal works are, of course, entirely governed by the size and character of the works and the quantity of sewage treated; but it cannot be emphasised too strongly that where the outfall discharges into a non-tidal stream absolute adherence to instructions is essential, especially in the case of contact beds, where three shifts in twenty-four hours is adopted. In this case there is no excuse for lack of attention at night-time, but when men are working twelve or thirteen hours through the night, under little or no supervision, the author has found neglect sometimes ensues.

The author has made a practice of supervising or inspecting personally at all hours of the day and night, without notice, and he has found this has eliminated to a large extent the risk of serious neglect by his men.

Under the heading of "Sewerage" he suggests separating the management of new and existing sewers so far as the individual staff is concerned. This, of course, would again have reference to a large district, or one rapidly developing, and in practice he has found that the outdoor building department can well supervise the laying of new sewers without undue overlapping, since the majority of these are laid in new streets by private estate owners.

Maintenance, flushing and connections to sewers should be as far as possible under the control of one man, who should be solely responsible for seeing to the actual work of the sub-department, but in practice it is often found desirable to arrange for house connections to be supervised by the building department, which, as an inspector should be upon the works daily, saves time and eliminates overlapping of inspection.

It is needless to detail the many sub-headings that would apply in this section, but the author would emphasise the importance of any spare time being spent on keeping the surveys and levels absolutely up to date, and shown on the standard ordnance maps of the district, since he finds that the map mentioned under sec. 20 of the Public Health Act, 1875, is seldom complete; yet probably every engineer of a large district will daily reap the benefit of such a map if and when completed. The surface and invert levels should be entered on such maps at every manhole or change of direction or gradient.

OPEN SPACES.

In dealing with this important section of a municipal engineer's work, it may again be reasonably subdivided under the following headings:—

Maintenance of existing open spaces.
Provision of new open spaces.

Briefly referring to the latter heading, the first consideration is defining the most suitable position and negotiating for it. This, of course, is exclusively a matter for the head of the department, probably in conjunction with the clerk of the council.

The design and lay-out, construction of walks, banks, flower beds, shrubberies, gymnasia, drainage, water supply, châlets, conveniences, &c., would be best prepared by the indoor staff and the supervision undertaken by the outdoor staff.

A matter which is now continually before municipal engineers is the desirability or otherwise of executing certain new works by means of direct labour. The author has had experience of both the contract and administration system to some large extent, and he is of opinion that there are many works in which direct labour can be economically adopted; but if they are to be successful and economy is to result, the engineer should have an absolutely free hand in regard to the employment of labour, and should be exonerated from the risk of criticism before the work starts, should he find it necessary to modify the labour conditions.

The question of direct labour is one which, at some time or other, is bound to be considered by every municipal engineer, and no one should neglect to take advantage of the experience of his *confrères* in this matter. Personally, the author has consistently adopted direct labour on new sewerage works and open spaces with both satisfactory and economical results, while he has found it also beneficial in the construction of open-air baths and various road improvements; but where buildings are to be erected, or where there is any question of payment by other persons, such as in private street works, he prefers the contract system.

With reference to the financial aspect of existing open spaces, he is of opinion that the best organisation can be obtained by making the senior man at each open space responsible directly to him or one officer for the proper maintenance, mowing, pruning, turfing, and upkeep of footpaths, roads, ponds, &c. The quarterly payments in respect of footballs and cricket pitches should be made at the chief office of the engineer or accountant, while small payments in respect of tennis courts, bowling greens, conveniences, &c., should be received by the senior employee, and accounted for daily or weekly to the engineer.

In this, as in all other cases where officials or employees are receiving monies, a guarantee policy should be obtained and the premium paid by the council, so that no ultimate loss can possibly be sustained through the carelessness of such officials or employees.

The systematic upkeep of iron and wood work is often neglected through carelessness, bad organisation, or false economy, and therefore one cannot be too careful in clearly defining the word "maintenance."

ARCHITECTURAL WORK AND SUPERVISION OF BUILDINGS.

This department can be best divided into two main headings—viz., indoor and outdoor work. Alternatively the departments might well be as follows: (1) Supervision of new streets and buildings under by-laws, and (2) design and construction of any architectural works.

There is of necessity considerable indoor work as well as outdoor supervision attaching to each of these, and the principle to be adopted must be decided by the engineer when reorganising. In practice his hands may be tied by the provision of a private Act enforcing the employment and defining the duties of building inspectors, in which case in some of the private Acts provision has also been made for the acquirement of fees in respect of supervision, such private Acts having been based upon the London Building Act. When such fees are obtainable the salaries of the building inspectors are paid therefrom, and it is a moot point how far their time can legally be allocated to other work.

The author had considerable experience in this department under Mr. O. Claude Robson, M.INST.C.E., an esteemed past-president of this institution and engineer to the Willesden Urban District Council, a town which was for many years the most populous urban district in the kingdom, and the organisation in this department was practically ideal.

Owing to the magnitude of the building operations at one time a staff of five building inspectors was maintained out of the fees received for supervision, and in this and other cases the R.I.B.A., Inst.C.E., Inst.M. and Cy.E., or S.I. qualifications were a *sine qua non*. One building inspector undertook the major portion of the indoor work, which consisted largely of checking drawings and advising architects, builders, or owners upon plans, receiving fees, and general management of department, while the other inspectors carried out the whole of supervision in certain defined areas, recording and tabulating the results, which were submitted monthly to the council.

The duties included the necessary surveys of all new streets and buildings, thus keeping the ordnance maps up to date, while new estate sewers were also supervised and recorded by this department, as previously noted.

The architectural department should consist of one or more capable assistants or architectural draughtsmen, since it is utterly impossible for the engineer to do more than sketch his designs, and of course their working out often requires considerable time and experience. In most offices both the architectural and engineering drawings are prepared in one general drawing office, and it is usually desirable to make one assistant, preferably with both engineering and architectural knowledge, the head of such office.

As a general rule this assistant should receive all instructions from the chief respecting the preparation of drawings, the making of surveys for improvements,

the general office drawing routine work, the preparation of estimates and the writing of specifications, but it is also desirable that the engineer should take a personal interest in the actual work of every member of his department, since by that means alone can he obtain a true insight into each assistant's individual character and ability for certain work, and thus select those most suitable for advancement.

The author would advise that the fire protection department should be assisted by the building inspectors in respect of means of escape in case of fire under the Factory and Workshops Act, and the sewerage department in respect of the provision for elimination of petrol from sewers, since both matters can best be dealt with by these officials without any overlapping in supervision. Too much care cannot be exercised in properly organising the systematic inspection and efficiency of all fire exits and also of all petrol filters, garages, or cleaning works where benzine or other inflammable spirit is much used.

The powers of local authorities are sufficiently defined to enable the sewers to be properly protected from the infiltration of inflammable spirit from private houses, garages, &c., but there will always remain the difficulty of soakage or washing from the surface of the carriageway, and to this extent the road inspectors or gangers should have instructions to immediately report to the sewerage department and the engineer any signs of excessive petrol or other oils on the carriageway, and until the sewer into which the oils may have drained is properly ventilated no access should be allowed thereto. The only overlapping involved by the above can be easily met by a written communication in duplicate.

COLLECTION, REMOVAL, AND DISPOSAL OF HOUSE REFUSE.

While this is one of the most important duties usually devolving upon the municipal engineer, it is equally one of the most unpleasant, and is probably the cause of more complaints than any other sub-department.

He must consider first the method of collection and disposal. Collection may be by contract or direct labour, and in each case by either horse haulage or motor traction.

Briefly, motor traction is beneficial where the shoot, deposit, or destructor is at a distance, or it can be economically adopted where the dusthins are placed on the footpath at night and are emptied daily. Direct labour can usually be more efficiently supervised and leads to fewer complaints than contract labour.

Having decided on the system, definite beats should be allocated to certain vans and collectors, and the collection from each beat should be completed each day. If this work is carried out properly no complaints should arise, but the author has found some difficulty in entirely avoiding these, owing partly to the substitution of other men during sickness or accident and the interference with normal organisation during holiday seasons, such as Christmas, Easter, Whitsun, &c.

Some difficulties are also experienced in regard to empty houses or access to occupied houses when no one is at home, but the author's practice on such occasions is to deliver a card stating when the next collection will be made, and the men report on tabulated sheets the reason for non-collection. By this means it is possible to check whether non-collection is through the carelessness of the men or the temporary absence of the occupier.

In the disposal of house refuse, a proper record should be kept of the quantity received, preferably by means of a weighbridge at the destructor, or the number and size of van loads at the shoot. This record should be checked with corresponding periods in previous years, and also with the average daily quantity, which should show a gradual increase with the growth of the district.

Special care is also required in testing the tare weight of collecting vehicles, since although it is wise to record the tare on every vehicle, dust vans are especially liable to be incorrect, owing to the inclusion of "tots," glasses, tins, shovels, baskets, &c., and unless special care is exercised in the clearing out of the vehicle, a considerable excess weight over the actual amount collected may be shown. This, in the case of piecework, may not always be accidental, and to avoid it the only proper method is to tare these vehicles out after every load.

In connection with the destructor, proper records should be kept, preferably in tabular form, of the amount of steam raised, water and coal (if any) consumed, power used for pumping or other purposes, quantity of clinker made, amount of clinker broken in crusher and used for special purposes, such as mortar, brick and flag making, tarred clinker for roads, &c., and a careful analysis of the cost of other materials and labour throughout, so that comparison may be made with corresponding figures at different periods and those of other local authorities, which, with proper allowances for varying conditions, form a good guide as to the economy and efficiency with which this section of the department is being administered.

In the case of extensive repairs to chimney shafts, main flues, &c., provision will have to be made for the removal of the refuse, by road, rail or water, to another destructor or shoot, and sufficient foresight must be exercised to avoid any interference with the normal daily collection and disposal of refuse.

SANITARY ADMINISTRATION (INCLUDING PUBLIC CONVENIENCES).

The sanitary administration work in an engineer's department varies very considerably in different localities.

In many places, especially the smaller urban and rural districts, the office of sanitary inspector and inspector of nuisances is combined with that of surveyor, and the same officer will therefore have full control of all practical sanitary administration.

In the larger districts such is never the case, the sanitary inspector being under the supervision of the medical officer as chief of the public health department.

The organisation in most districts requires sanitary work to new buildings, and alterations or additions, to be exclusively under the control of the engineer, while drainage work to old buildings is left entirely in the hands of the sanitary inspector. This arrangement avoids overlapping and possible friction. Any extra men that may be required by the medical officer's department are obtained from the engineer, but during such time the sanitary inspector is responsible for the efficient performance of their work. In large cities the medical officer should employ and certify for his own staff, but such an arrangement is not usual in the smaller districts.

Public conveniences should be exclusively under the control of the engineer, all employees in this sub-department being certified for by him.

It is desirable that one man should be made responsible for their efficient supervision and cleanliness, and should the attendants also collect monies it is imperative that the most careful records should be kept in tabulated books, and a daily return of such monies made to the engineer or accountant's staff, a signature being given both by the assistant receiving them and by the attendant. Even in spite of the utmost care, dishonesty is known to occur in this section of the engineer's department.

A careful analysis of figures for corresponding periods by different attendants may often enable petty thefts to be traced, and in all large cities the regular interchange of attendants on different conveniences will generally lessen the risk of theft or locate the thief.

HOUSING AND TOWN PLANNING.

The Act and the duties defined therein, so far as they affect the engineer and surveyor, may, I think, be divided into two main headings—viz., (1) the design and construction of town extensions, including the improvement of existing or the creation of new highways with artistic amenities, and (2) the procedure defined in the Act in connection with unhealthy dwellings or areas.

The author is of opinion that the former should be exclusively a matter for the engineer's department, while the latter must of necessity be worked by the public health department, either alone or in conjunction with the engineer's department. It seems desirable that all inspections in connection with the existing housing conditions should be carried out by the sanitary officers, and that the engineer should only step in when specifications are required or constructional work is to be carried out, or when the existing defective buildings are to be removed entirely and the area cleared.

In the case, however, of town planning, the whole work should be undertaken by the engineer's department. This, in a large district, may be well separated into two sections—viz., the outdoor work, which would include the preparation of all necessary surveys and contours, and the indoor work, which would consist

[illegible]

[illegible]

FIRE PROTECTION AND EXTINCTION.

[illegible] three [illegible] only one [illegible] applies to any individual district, although a combination of two, if not three, is occasionally found.

They are: (1) Brigades and equipment entirely maintained at the expense of the ratepayers, (2) equipment maintained by the ratepayers and brigade practically voluntary, and (3) volunteer brigade and equipment maintained by voluntary subscription.

In the last case the engineer and surveyor would not be [illegible] would be [illegible] municipal appointment.

[illegible] large number of country towns and urban districts, and can and does prove, in most cases, a very efficient system of fire protection. As a general rule [illegible] paid caretaker, resident engineer or drivers, these men should also be under him, but the members of the volunteer brigade would be entirely outside his control, unless he were elected and appointed the chief officer.

The organisation should be on somewhat similar lines to that of a paid brigade so far as the equipment and administration is concerned, but there must [illegible] deal control owing to the chief volunteer officer taking the command at fires, and this [illegible] of efficiency.

It is most important if efficiency is to be maintained, and thus the expense of a paid brigade avoided, that the engineer should take every opportunity of furthering the brigade's interests and keeping the [illegible] up to a high standard, since by this means all members of the brigade are usually imbued with a similar desire for excellence.

A paid fire brigade should be provided with the [illegible] and equipment, as is the case in all large cities of the Empire, especially the Metropolis.

The precise time that the volunteer system should give place to the organised fire department must, of course, be left to the local authority to decide, but [illegible] the engineer's judgment and advice may form a very important factor.

In a city [illegible] exceeding 200,000 inhabitants the fire department may be organised under a chief officer in no way responsible to the engineer, but in the small towns the author suggests that the superintendent should be responsible to him as chief officer.

The area of the district must govern the question of central and branch stations (if any), but it may be assumed that, with modern appliances, centralisation is generally desirable, with a complete installation of reliable fire alarms. Extra sub-stations for isolated or distant areas, with limited equipment, may in some cases be useful but fire escapes and first aid appliances, as saving life is more important than extinction.

Fire appliances alone are worthy of a special paper, and no attempt is therefore made to deal with them.

The organisation of staff, if a small one, will require [illegible] the largest number of men being available when required, and yet to make proper allowance for rest, recreation, and holidays.

Absolute discipline should be enforced at all times, as by this means the confidence of the ratepayers is obtained, and the men become thoroughly conversant with their duties. Drills and turn-outs should be frequent when fires are few, and *vice versa*.

Most careful records of all turn-outs, drills, false alarms, and defects in appliances, or neglect by men, should be kept, and not only filed, but actually used for reference purposes, as by this means similar troubles can often be avoided in future and improvements effected.

STORES AND DEPOTS.

A complete or even partial scheme of reorganisation in connection with central or branch depots and storeyards requires most careful consideration, since after the cost of buildings, stabling, and other structural works for the reception of horses, vans, motors, [illegible] been incurred, the capital [illegible] of subsequent alteration will [illegible] largely wasted. The greatest care and ability must therefore be exercised by the engineer before making any recommendation, and he [illegible] not the present, but also the ultimate possibilities and needs of the area of which he is the controlling officer.

It is difficult to lay down any hard or fast line as to centralisation, but it may be taken as an accepted fact that all horsed vehicles should be housed within a reasonable distance of the area upon which they are to be used. At the same time the multiplicity of storeyards or depots permanently increases the establishment charges, for which, as a general rule, a varying percentage is required to be added to the cost of works.

MISCELLANEOUS.

[illegible] would, of course, be included these important departments which are, in the larger municipalities, so often placed under a separate head, such as electricity generation, tramways construction and maintenance, gas manufacture and supply, water supply and distribution, management of markets, supervision of abattoirs, management of cemeteries and burial grounds, supervision of labourers' dwellings, baths and wash houses, and management of piers, harbours, &c.

It is impossible to detail even the principal points that should be considered in the organisation of any of these, but it may be assumed that the principles already enunciated are equally applicable to many of the above departments.

ESTABLISHMENT AND STAFF.

The author cannot conclude without making a few observations under this heading. In the earlier part of the paper it was pointed out that perfect loyalty and absolute integrity of thought and deed would tend to result in the development of an excellent staff.

In addition, every assistant should continue his studies by means of professional literature, lectures, &c., and always strive to learn and know more than is necessary for the work required of him, since by that means alone he is able to fit himself for a more responsible position.

Omitting many other points, one small one must be emphasised—viz., the initialling and dating of all plans, drawings, or documents by the assistants or clerks engaged thereon, and the checking and initialling of all calculations, quantities, and certificates, and [illegible] easy in the midst of the multifarious duties which devolve upon this department for a slip to be made, but so difficult to restore that confidence which all desire and endeavour to merit.

DISCUSSION OF MR. WILLIS' PAPER.

Mr. J. S. Brodie (Blackpool) said his first general criticism was that Mr. Willis included far too much as belonging to the borough engineer's department, and under his control. Surely the ideal state of things for the borough engineer was this: A maximum of salary and a minimum of work. Now, acting on these broad lines he found that of eleven sub-departments at least four might with advantage be taken out. For instance, there was the collection, removal and disposal of house refuse; surely that was not for the borough engineer, but for some practical man responsible to some other department altogether, who could supervise the work much better. Sanitary administration, including public conveniences, was work for the medical officer of health, and far better carried out by a cleansing superintendent. They had a very useful function to perform, and it would not be done better if done under the supervision of the borough engineer. As to fire protection and extinction, were they to be dragged out of their beds at all times of the night to put a fire out? Let him do his work in the daytime, and let him have a good night's rest. Stores and depots; surely that was work for the accountant's department. Then, in regard to statistics, that was the work of the borough accountant's department. He would not bother his head with statistics at all. He had them got out and then made use of them when he received them. Having said that much of how he disagreed with Mr. Willis, he must commend the very thorough way in which he had gone into his subject. All of them who knew Mr. Willis knew him to be a young man of experience, ability and energy, and if he had fallen short of what he had given them in his paper, they would have been very much disappointed. He proposed a vote

of thanks to Mr. Willis for this most excellent and painstaking paper he had given to them.

Mr. J. W. COCKRILL (Great Yarmouth) said he was entered to join issue with his friend Mr. Brodie. If the surveyor had control of some of these items a good deal of confusion took place. If they had recourse to the medical officer of health, gave him half-a-dozen men to deal with, and did not get the trained half-dozen in the employment of the corporation, he knew nothing of men. As to town planning, municipal engineers had not made enough of the subject. Because town planning was talked about, had not everyone of them been arranging out parks and gardens and street widenings and improvements, which come under town planning? If it had not been for these, what would have been the condition of the various towns? Take Mr. Willis, he had not a sufficiency of staff to enable him to keep up statistics, but he believed it could be better done under his supervision than in any other department. There was one very important point. Costs and observations with reference to road work should be taken most carefully, and he hoped they would all try to get together costs of maintenance and durability of the various kinds of road work in a way which would be useful to the institution in years to come.

Mr. S. PEARCE (Eccles) said he regarded this paper as one of the best presented to the meeting. It certainly did Mr. Willis a great deal of credit, and said much for the thoroughness of the man. In the younger members of their profession would only master every clause in this paper it would lead to their reaching the topmost pinnacle of their ambition, because it would make them masters of the work they had to do. He did not quite agree with Mr. Brodie in his remarks. There was only one department which Mr. Willis had included which he thought the borough engineer could leave to another department, and that was fire protection and extinction. Surely the stores and depots should be under the control of the surveyor and not of the borough accountant. With regard to what Mr. Willis had said as to a true *esprit de corps* existing in every official, from the highest to the lowest, he considered that every borough surveyor ought to assist his assistants. If they read that clause and acted upon it, they would get a thoroughly harmonious feeling in each department of the surveyor's office. Each surveyor ought to think of the advantages which he could give to his assistants by helping them. (A Voice: We do.) He did not think the majority of surveyors had sufficiently realised their responsibility in this way. He could cite a case which happened a few months ago, where an assistant asked his chief for permission to attend a meeting, and the surveyor answered: "No; I do not go to those meetings, and I do not think you should." He thought a surveyor who did that had not a proper appreciation of his duty to his assistants. Let them treat their assistants as they would treat their own sons. There was only one other point, and that he would commend to any councillors who were present. Mr. Willis said his council had endeavoured to reward the genuine workman who had laboured many years in the municipal service by relieving him of practically all his duties, and paying him a nominal wage of 8s. per week. They ought to admire Mr. Willis for mentioning that in the interest of old workmen. They had an old pavior in Eccles who had put in fifty-two years' service—a typical Lancashire man. The council had given him a wage of 20s. a week, and for the last two years he had done practically nothing. If he felt well enough he went to the yard, and if they were taking up a road he acted as flagman. He thought if workmen had given good service their latter years should be days of peace and happiness.

Mr. F. W. PEARCE (Twickenham) supported the vote of thanks. He did not propose to criticise the paper in detail, because the information was so complete that he thought this was hardly necessary. He thought there were one or two useful points which might help them in dealing with the paper. The keynote of the paper seemed to be summed up in efficiency and economy, and those two items were generally very closely associated. It had been suggested that this paper should be recommended to the careful consideration of the younger members of the institution. He entirely supported that suggestion, and he should like to go a little further and suggest that it would prove very useful to the older ones when they found time to read it. He should like to suggest a practical application if there was any way of carrying it out—that was that this paper should be circulated to all members of local authorities. If that could be done, and if they could be induced to read of some of the difficulties under which their engineers had laboured in the past, he was convinced those difficulties would disappear. It only required the careful consideration by any business man of the proposals contained in this paper to enable him to have a clearer conception of the duties of the borough engineer and surveyor. It was quite true that in very large cities some of the items to which Mr. Willis had referred would of necessity have to be placed under other heads; but he was quite satisfied of this that, provided the engineer was of the calibre of the writer of this paper, the longer they could be deferred the better. He agreed with Mr. Cockrill that the attempt to take work and men from the surveyor's department and place them under the medical officer of health was a mistake. He said that without any disparagement of the medical officer of health, whose professional qualifications were high, but he had never been trained to control men, while the surveyor had been trained to control men. With regard to the questions dealt with in some detail in the paper, the question of statistics, the preparation of progress sheets and maps and accounts, he was convinced that this work should be done in the surveyor's department, and if possible he should have his own accountant rather than their accounts should be kept by another department. He was of opinion that if accounts of works in progress were kept in their own department money would be saved. If the whole work of a municipality could be brought down to a business proposition in the nature of money expended, and a strict analysis obtained of the money expended, so that when members of the local authority were dealing with such a question as the salary of the surveyor and his staff they would have all the details as a business proposition, there would not be the difficulties raised that there were to-day. Local authorities were too much inclined to question expenditure on a particular item rather than on the results obtained. They understood that what Mr. Willis had put before them was the ideal, but in all their work it was by placing the ideal before them and trying to get the ideal that it became the actual. He was satisfied if this paper could be rescued from the oblivion which sometimes awaited the productions of authors for the "Transactions," and it could be kept before every municipal engineer and surveyor, before every member of his staff, before every member of his local authority, and even the public, it would be a very good thing done.

Mr. E. S. SINNOTT (Gloucestershire) asked, with reference to statistics, if Mr. Willis had evolved any form or forms in connection with work which enabled one readily and at a glance by consulting the chart to keep an eye on the consumption of stores. He might mention in his own case his county council owned twenty-two steam rollers, and two petrol motor rollers, and lately he had got out a diagram by which he could see the consumption of coal, oil, and waste, and everything used in connection with each roller. He wanted to ask whether Mr. Willis had compiled or thought out any method by which the surveyor could at a glance control the action of those working under him. He had found it of very great value, because if one man was wasteful with coal, oil, or waste he could draw the superintendent's attention to it. He had not yet evolved any system in connection with police stations. They had a large number of police stations which he had to look after, and these required painting and papering, and so on, and he had gangs of workmen who were constantly on the move. Any gentleman who had charge of buildings would be rendering a great service to people like himself if they could give them the benefit of their knowledge.

Mr. F. C. COOK (Nuneaton) said many of the conclusions at which Mr. Willis had arrived were fairly obvious, but the conditions which obtained in different towns varied so much in character that one could not do more than lay down general principles. Looking at the chart, Mr. Willis had included many matters for which he, personally, should not care to take responsibility. He believed in doing nothing which would encroach upon the department of another officer, and he would take care that another officer did not encroach upon his own. There was a danger of the municipal engineer being regarded in the light of a local Pooh-Bah, against which they should guard. They should take care not to incur the

[illegible] Any system which tended to [illegible] the personal factor in a subordinate's [illegible] responsibility, or to deaden his initiative was a mistake. He ventured to suggest it was a very great mistake to impose unnecessary clerical work upon men who were unassuming [illegible], and who had to make repairs certainly on [illegible] than to waste time by writing reports which would be [illegible] better spent in the supervision of them [illegible] standard [illegible] at in regard to [illegible]. They would not [illegible] varying [illegible] in the expense of tar-spraying, for instance, if costs were all got out on a [illegible] basis. He thought it would be of great service to the profession as a whole if they had a paper at some [illegible] conference to enable them to lay down some basis of common agreement in such matters.

The Chairman (Mr. F. W. A. Hayward) pointed out that Mr. Bissett had said at the beginning of the discussion. He was not in agreement with him that certain matters could be better managed by the medical officer of health or the borough accountant. He thought if work was placed under their control they should see that work was done properly, and as Mr. [illegible] suggested, keep it in their own hands. Every man should try to make it his ambition to make his appointment pay for itself, so that he could feel he was handling over the job in a far better position than when he accepted it. If that spirit animated everyone of them, they would be in a far better position than they were to-day.

Mr. Willis, in replying, said he should like to thank them very much for the very kindly way in which they had received the paper, and particularly those who had joined in the discussion and made such valuable remarks, even though they were in conflict with his suggestions. If that were so, the small amount of time which he had given to the paper had been more than repaid.

(To be continued.)

HERTFORDSHIRE SURVEYORSHIP.

APPOINTMENT OF MR. J. S. KILLICK.

The appointment of Mr. J. S. Killick, ASSOC.M. INST.C.E., assistant engineer to the Road Board, as county surveyor of Hertfordshire, in succession to Mr. Urban A. Smith, M.INST.C.E., has been confirmed by the county council.

Mr. Killick, who will receive a commencing salary of £800 per annum, will commence his new duties on September 1st.

Winnipeg Water Supply.—Tenders for the construction of some 85 miles of aqueducts, in connection with the Shoal Lake water project, costing approximately £1,791,000, will be called for shortly (the *Standard* states) by the Administration Board of the Greater Winnipeg water district, and they will be opened on September 15th. The work will be divided into five sections, exclusive of the Indian Bay intake. The aqueduct will extend from the reservoir site beyond Transcona to the Shoal Lake end.

Direct *v.* Contract Labour.—The county surveyor of Monaghan, Mr. J. J. Hannigan, in the course of a report stated that in the Carrickmacross district there was £1,600 worth of works for which they could get no contractors, while in the Cootehill and Clones districts there was £1,242 worth of work for which no contractors could be found. All this went to show that the contract system had broken down, and the question they had now to consider was how the roads were to be maintained. Resolutions were read from the Carrickmacross, Cootehill, and Clones Rural District Councils approving of a scheme of direct labour. The chairman (Mr. Thos. Toal, J.P.) said there was no intention of having a scheme for the entire county. It was only for those roads for which they could not get contractors. In the Monaghan rural district the contract system was working satisfactorily, and that being the case he was opposed to a direct labour scheme for Monaghan. The council postponed the consideration of a direct labour scheme, and meanwhile decided to allow the assistant surveyor a commission of 2 per cent on the cost of the direct labour schemes they were called upon to supervise.

THE QUANTITY SYSTEM.

Some of the advantages of the quantity system of estimating as enumerated by Mr. G. Alexander Wright, of San Francisco, and given in the Toronto *Contract Record*, are as follows:—

(1) Saving of time and money.

(2) Greater precision in tendering.

(3) No uncertainty as to interpretation of plans or specifications (the quantities should govern).

(4) No visits to the architect's office [illegible] for explanations or otherwise.

(5) No other work is contracted for except the quantity set forth in the quantities.

(6) The contractor, if he so desires, can check up the quantities before signing the contract.

(7) No bidder can inadvertently leave out anything, and so in this way arrive at too low a figure.

(8) Not having to spend time taking out his quantities, the contractor has time to attend to more profitable business.

(9) Systematically arranged bills of quantities duly priced (whether work has been secured or not) form excellent data for making future estimates.

MAIN ROADS EXPENDITURE.

Replying to a question in the House of Commons on Wednesday, Mr. Herbert Samuel, President of the Local Government Board, presented the following statement showing the expenditure of county councils in England and Wales on main roads in certain years, and the amount of such expenditure estimated to have fallen upon rates:—

Year ended March.	Total expenditure	Amount of such expenditure estimated to have fallen upon the rates.†
	£	£
1891* ...	1,465,000	847,000
1900 ...	2,050,000	1,024,000
1910 ...	2,853,000	1,856,000
1912 ...	3,356,000	2,154,000

* This is the first complete year for which figures are available.

† The figures in column 3 are estimates only. They represent expenditure remaining after deducting the amounts estimated to have been met out of Exchequer grants and receipts other than rates and Exchequer grants.

Dissolution of Partnership.—We understand that the partnership between Messrs. G. P. Knowles, J. B. Knowles and K. D. D. Grazebrook, who carried on the business of consulting engineers and surveyors and the preparation of candidates for technical examinations at 39 Victoria-street, Westminster, S.W., under the style of "G. P. Knowles," has been dissolved by mutual consent so far as concerns Mr. J. B. Knowles, who has retired. Messrs. G. P. Knowles and K. D. D. Grazebrook will continue to carry on the business in partnership at the same address.

Stourbridge Waterworks Scheme.—The new pumping engine and other works carried out by the Stourbridge and District Water Board were formally inaugurated on Tuesday last. The scheme included deepening the borehole at Coalbournbrook, the construction of a 500,000-gallon reservoir at Doctor's Hill, the reorganisation of the mains, and the provision of pumping plant, and the cost was £18,000. The consulting engineer was Mr. W. Fiddian, and it was stated in the course of the proceedings that his estimates had proved quite accurate.

London Tramway Schemes.—The London County Council propose to construct a new tramway from King's-cross to Harrow-road *viâ* Euston-road, Marylebone-road, and Edgware-road. This scheme was recommended by the Royal Commission on London Traffic, and would abolish the dead-end in Harrow-road and link up the existing tramways in that thoroughfare with those at King's-cross, thus enabling through communication to be established between Willesden and the City and East London. Another proposed line is from Hampstead-road to Theobald's-road, *viâ* Tottenham-court-road, Bayley-street, and Russell-square. This scheme, part of which was recommended by the Royal Commission, will abolish the dead-ends at Hampstead-road and Theobald's-road.

Royal Sanitary Institute Congress at Blackpool.

ENGINEERING AND ARCHITECTURE SECTION.

"The Economical Supply of Hot Water to Artisans' Dwellings," by Alderman Henry Burridge, and "House Drainage: Some Observations on the Barrow-in-Furness System," by Mr. Arthur Race, borough surveyor of that town, were amongst the first papers to be considered in the Engineering and Architecture Section of the recent congress of the Royal Sanitary Institute at Blackpool. Some extracts from Alderman Burridge's contribution will be found in our issue of last week (p. 84).

HOUSE DRAINAGE.

Mr. Race said his belief was there could be no doubt that the disadvantages arising from the use of intercepting traps were substantial and of serious practical importance, and that some of the most dangerous effects arising out of the disadvantages were concealed from view, and might remain in existence quite unknown to the householder for a considerable time.

THE BARROW-IN-FURNESS SYSTEM.

The author proceeded to say that the chief feature of the Barrow-in-Furness system of house drainage was that the main house drain was not trapped from the sewer, a ventilating pipe being placed at the highest point of the drain, and acting as a ventilator both for the sewer and drains.

Proceeding, Mr Race said: "Where drainage of surface water from houses is required in the case of sewerage on the duplicate system, the rain water downspouts are connected into a bend of the drain, which is connected to the surface-water sewer without any trap whatever. I do not consider this method to be ideal, as the drains become choked at the bend, and it is often a considerable time before the chokage is discovered, injury to health and property often having occurred in the meantime due to dampness. A better method of dealing with this drain would, of course, be to discharge the rain water downspout on to a gully at the head of the drain. Where rain-water pipes have to be connected to a combined sewer they are connected to a back inlet gully or discharge on to a P trap.

"The size of pipes usually laid in drainage work in Barrow is 4 in. for rain-water pipes, yard gully, slop-stone and water-closet branches, the main drain being 6 in. diameter between the water-closet branch drain and the sewer. The gradient generally obtained is one of 1 in 30 for 4-in. pipes, and 1 in 40 for 6-in. pipes, and the joints are made with tarred gaskin or yarn, and cement and sand, 2 of cement to 1 of sand.

"Only pedestal wash-down closet pans are permitted to be used, and for internal water-closets the pan and trap must be in one piece. The joint between closet pan and lead bend through wall has to be either by a flanged joint bolted on or by using a brass thimble and Portland cement connection to the earthenware, having a wiped solder joint to the lead soil pipe."

Prior to 1912, when the system was amended, the connections from the internal water-closets, &c., were disconnected by a "Bristol" trap placed on the branches, a separate inlet and outlet ventilator being provided for such branches.

Continuing, Mr. Race said: "Now this system has been carried out in Barrow since about 1878, and, with a reservation regarding the 'Bristol' trap, it has proved eminently successful, and must have been far ahead of the times when introduced into Barrow by the then borough engineer, the late Mr. Jacobs. In addition to giving general satisfaction from a house drainage point of view it solves the difficulty of sewer ventilation (a serious problem in many towns), as there is a current of air in all sewers, air being admitted by the open manhole and lamphole covers in the streets and extracted by the ventilating shafts, which are provided at the head of every house drain, complaints from sewer smells being practically unknown in Barrow."

Good as the system had proved itself to be, after studying the findings of the Local Government Board's Departmental Committee, in 1912, the author considered whether or not the "Bristol" intercepting trap, as used in Barrow on branch drains to internal water-closets, &c., was not open to the very objections proved against the intercepting traps when used to disconnect house drains. He believes the intended duty of the "Bristol" trap was to prevent gases from the sewer and drains not finding their way into the building, either by way of (*a*) defective joints or pipes, (*b*) the temporary or permanent unsealing of sanitary fittings. There could be no question that gases from sewers and drains should be prevented from entering the house, and the question that arose was whether this could be better done with or without the "Bristol" trap. In order to investigate the matter the author obtained permission from owners of property in several parts of the borough to open up and break into the "Bristol" trap so that its actual state under varying conditions could be ascertained.

In the case of two terraces of houses (each house having on the ground floor a bath and water-closet connected into one drain, this being disconnected from the main house drain by a "Bristol" trap, the distance between the outlets of the bath and water-closet and the trap being not more than 2 ft.), cases were found where there was no seal in the trap, and in some other cases the traps were filthy, a considerable deposit of sewage being found on the house side of the trap. This is what was found where connections most favourable to the trap existed, and where the conditions were less favourable the result of the examination proved that the objections to the "Bristol" trap as used in Barrow are somewhat similar to those previously referred to regarding intercepting traps, and that the disadvantages of the "Bristol" trap outweigh any advantages it might possess.

It was found that a certain amount of sewage splashed on to the inside face of the trap above the water line, and particularly on to the fresh-air inlet, which is brought up to the yard level. The "Bristol" trap interfered with the proper flushing of the drain, and at its best prevents the free flow of sewage. Although it was better flushed, owing to its nearness to the sanitary fittings, than the intercepting trap as generally used in other towns, it was found in practice that it did get choked, and when that was the case gases were liable to be given off and escape into the yard by the inspection eye and fresh-air inlet, which was covered with a grate.

Mr. E. Willis (Chiswick), in proposing a vote of thanks to the authors of the papers, said he believed they would have to come round in the future to the Local Government Board's suggestion with regard to the avoidance of intercepting traps. The only point which they must go very carefully into was as to how they could properly ventilate the sewers when changing over. He had tried to get his council to drop the intercepting traps on new estates where every house took its due share of the ventilation of the sewers. He quite agreed with Mr. Race that the old-fashioned trap was perfectly useless and was a snare and a delusion, for it simply meant that they were collecting matter and giving off odour.

Mr. G. W. Lacey (Oswestry) said Mr. Burridge's system of supplying hot water to artisans' dwellings seemed a very practical and ingenious one. There appeared to be one difficulty with the arrangement. He thought it would be better if the supply of water to the boiler were governed by a ball valve. The stop-tap might be left running, which would not only obviate the possibility of getting hot water, but would result in waste. He would like to know whether Alderman Burridge had a separate flue to the boiler. The boiler had to serve a dual purpose, and he was not quite certain if the flue should be separated from the kitchen range flue. The cost given by the author was £10, without fixing, an amount that appeared to him to be somewhat excessive. They could buy a decent bath and provide the whole of the fixtures which were indicated at something more like £6 than £10.

Mr. C. J. Jenkin (Finchley) said that in the cottages they had built so far they had not given hot water. In his district the system adopted of getting water into the copper would be quite contrary to the regulations of the Water Board. With their regulations, if the pressure was taken off the main, and the copper was full of dirty water, the dirty water might be drawn back into the main. He understood the author mentioned the use of water from the copper

[illegible] ordinary purposes, but it seemed to him [illegible] [illegible] suggestion that the [illegible] [illegible] the plumber [illegible] [illegible] the same for ordinary purposes. At the present [illegible] [illegible] to be [illegible] the sanitary [illegible] [illegible] [illegible]

The Surveyor

And Municipal and County Engineer.

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CORRESPONDENCE.

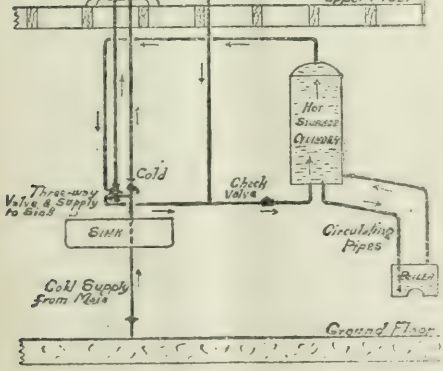
Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act ii., 2.

THE ECONOMICAL SUPPLY OF HOT WATER TO ARTISANS' DWELLINGS.

To the Editor of THE SURVEYOR.

SIR, The extract from a paper by MR. HENRY BURRIDGE, in last week's SURVEYOR, relating to this subject, is most interesting, and the method he describes has undoubted advantages under particular circumstances. It would appear, from the description given, however, that *only the bath* can be supplied with a "hot" tap from the apparatus, and



even this useful, if not ornamental, acquisition has to be fixed *either* in the scullery, *or* the kitchen to be so supplied—that is, the bath must be at a level below that of the water in the combination range and copper. The sink, being above this level, obviously is precluded from the luxury of a "hot" tap.

Experience in the provision of proper housing for workers (and I venture to think we at Letchworth may claim to have had a moderate share of such experience) goes to show that artisans who can afford to pay the past-war plus rates, usually require and are rightly entitled to something more than a mere hot supply to a bath fixed in the scullery. And so it occurred to me on reading the extract above mentioned that many of your readers—including Mr. Burridge, would perhaps be glad to know of a well-tried, simple, and inexpensive method whereby hot water can be supplied to bath *and* sink, and, moreover, allows of the bath being fixed either up or down stairs.

This particular system, which, I may add, has been in use for several years, and is installed in some 200 cottages, at Letchworth and elsewhere, resembles the usual domestic boiler supply apparatus, so far as kitchen boiler, cylinder and circulating pipes are concerned; but no cold tank in the roof is required, with its usual pipes, ball valve, &c. The cold supply, as in the system described by Mr. Burridge, comes direct from the mains, the principle employed being that of displacement of the hot water contained in the cylinder by cold water under pressure.

The hot supply pipe is taken from top of cylinder to the sink, where it is connected to a special "three-way" valve, and continues on from this to the bath, where it terminates with an open end which acts as a combined supply to bath and expansion pipe. A "check-valve" is placed on the cold supply pipe to the apparatus, and a "hot control" tap at bath, and sink, for turning on the "main" supply to cylinder.

The system is operated as follows: When hot water is required at the bath all that is necessary is to turn on "hot control" tap. To obtain hot water at sink, the "hot control" at that point is turned on, which operates at the same time the lever of the three-way valve, closing the way to bath and opening that to sink. Directly the "hot control" at sink is turned off the way to bath is automatically opened again, the three-way valve being so constructed that it is impossible to have the ways to sink and bath both closed at the same moment.

The cost of an installation on these lines, including fixing, &c., varies from £4 10s. to £5 10s., according to local conditions and the distance of kitchen fire from the points of delivery. Reference to the accompanying diagram will assist in making clear the various details mentioned. Bath and sink are not, of course, included in the costs given.

The advantages of this system were referred to recently by Mr. Maurice B. Adams, A.R.I.B.A., in his lecture on "Cottage Housing" at Carpenters Hall. It is also described in C. B. Purdom's book, "The Garden City."—Yours, &c.,

S. H. DONNELLY, A.M.I.M.E.

Letchworth.
July 21, 1914.

QUALIFICATIONS.

To the Editor of THE SURVEYOR.

SIR,—I beg to appeal to non-members of the Institution of Civil Engineers to ignore the restrictions mentioned in the advertisements for the borough surveyorships of St. Annes and Guildford and to send in their applications without hesitation.

Only by such action can it be forcibly shown that the Institution of Civil Engineers does not include all the best qualified men for such appointments.

Councils must be made aware that there are other equally good if not better and more suitable and practical qualifications than that of membership of this body. By acting on the lines I suggest comparisons may be drawn, and possibly a non-member may be chosen.

How many Assoc.M.Inst.C.E. candidates stood the test and were in the selected for Bridlington, where the salary was higher than that offered at St. Annes? For what reason should they now be specially earmarked for the latter place? Are these consolation appointments?

Personally, though a non-member, and without any local influence, I am applying, and look to my qualifications and experience being beaten by a better man, though perhaps not an A.M.I.C.E. May the best win always!—Yours, &c.,

MUNICIPAL ENGINEER.

July 18, 1914.

IMPROVEMENT OF SEWAGE FARM LAND.

To the Editor of THE SURVEYOR.

SIR,—In a paragraph appearing under the heading "Things One Would Like to Know," in your issue

[illegible] July last, it is asked if the clay soil of a sewage farm can be improved by dumping house refuse into it, and how long it takes to effect the change. In reply thereto, acting under the advice of Mr. H. Percy Boulnois, consulting engineer to my council, in August last I commenced dumping house refuse into the chalk and brickfield at Alton, on my work. The first section treated was not a complete success, the refuse being too deep, though it improved. The remaining part of the sewage farm needs about 7 inches in extent, and I intend to dog with excellent results, and have since been treated a second time. In this period—not yet a year—the soil is being transformed from a [illegible] to a loam. I may add I have seen ashes and house refuse ploughed into hop land of similar character, but in this case the combination between calcium, alumina and carbon does not appear to be effected so quickly as on sewage land.—Yours, &c.,

G. Bertram Hartley.

Town Hall,
Alton, Hants.
July 18, 1914.

STREET NUISANCES.

To the Editor of The Surveyor

Sir, In your editorial of last week you referred to a suggestion made by me in 1908 as to the nuisance caused by dogs in urban districts, and also as to preventing the depositing of sweepings on public thoroughfares and dealing with spitting. I am glad to see that after the idea has been germinating for six years it has at last burst through the husk of human apathy, and in time, if properly tended, may bring forth "rare and refreshing" fruit.

It would be interesting to have suggestions from the readers of The Surveyor as to a by-law or by-laws to control these matters, and how such by-laws can be enforced. I am prepared to make a suggestion, but prefer to give the opportunity to other and better tillers in the garden of sanitary science before placing before the lovers of decency and order a drastic, but effective, form of pruning knife.—Yours, &c.,

Reginald Brown,
M.Inst.C.E., M.I.Mech.E., F.S.I., &c.

Southall.
July 18, 1914.

NEW WESTERN ROAD.

THE TAX ON MOTOR OMNIBUSES.

The Middlesex County Council (Western Road and Improvements and Finance) Bill was read a third time and passed in the House of Lords on Monday.

Lord Montagu of Beaulieu moved the omission of the clause requiring motor omnibus companies to contribute ¾d. per car-mile towards the cost of the upkeep of the road. He said he considered that if the question were dealt with at all it should be dealt with by general and not by piecemeal legislation. The Road Board, who had given £400,000 towards the estimated cost of the new road, did not anticipate that there would not be a general user of the road, and a curious anomaly was that there was to be no charge for traction engines and heavy lorries with steel-tyred wheels.

The Duke of Bedford justified the imposition of the charge, and pointed out that in contrast to the heavy charges imposed on tramway companies the motor omnibus companies only had to obtain licences for their vehicles and they could run anywhere without contributing anything towards the maintenance of the roads.

Viscount Peel remarked that, while he felt the principle was a dangerous one, he supported the clause as a protest against the way in which the 'buses were allowed freely over the whole country.

Earl Russell asked where they were to stop once the principle of dividing up roads where they crossed the boundaries of a local authority was admitted.

Lord Strachie (Paymaster-General) considered that the matter should be hung up until the question could be considered as a whole.

Finally the amendment was withdrawn, and the Bill was read a third time and passed, as stated.

Northants and East Midlands Surveyors' Association.—A report of a recent visit of this body to Peterborough is unavoidably held over until next week.

OXIDATION OF SEWAGE WITHOUT THE AID OF FILTERS.

MESSRS. ARDERN'S AND LOCKETT'S EXPERIMENTS.

We have been favoured with a copy of a reprint of the paper entitled "Experiments on the Oxidation of Sewage without the Aid of Filters," which Messrs. Edward Ardern, M.Sc., and William T. Lockett, M.Sc., read at a meeting of the Manchester Section of the Society of Chemical Industry in April last. An abstract of the paper appeared in our issue of April 10th (p. 610), and now give the authors' summary and conclusions in regard to their investigations. Messrs. Ardern and Lockett state that their investigations have established:

(1) That the resultant solid matter obtained by prolonged aeration of sewage, which has been termed activated sludge, has the property of enormously increasing the purification effected by simple aëration of sewage, or, in other words, it greatly intensifies the oxidation process.

(2) The extent of the accelerating effect depends upon the intimate manner in which the activated sludge is brought into contact with, and upon its proportion to, the sewage treated.

(3) That, in order to maintain the sludge at its highest efficiency, it is necessary that there should not be at any time an accumulation of unoxidised sewage solids.

It is not necessary that the sewage should be kept in contact with the activated sludge until such conditions obtain, as its activity may be maintained by suitable aëration of the activated sludge alone.

(4) That temperature exerts a considerable influence on the oxidation process. The purification effected is seriously diminished at temperatures constantly below 10 deg. Cent. Up to 20–24 deg. Cent. no material difference in the clarification effect and general purification has been observed, although the nitrification change proceeds more rapidly as the temperature rises. At higher temperatures the clarification effect is somewhat interfered with during the earlier period of aëration, with a consequent delay in the establishment of nitrification. Subsequently the rate of nitrification somewhat increases.

(5) That, under the conditions of experiment, a well-oxidised effluent can be obtained by the aëration of average strength Manchester sewage in contact with activated sludge for a period of from six to nine hours. The percentage purification effected as measured by the usual tests is at least equal to that obtained by the treatment of sewage on efficient bacterial filters. The period of aëration naturally depends upon the strength of the sewage treated and the degree of purification required.

(6) That the activated sludge differs very considerably in character and composition from ordinary sewage sludge. It is in a well-oxidised condition, and consequently entirely innocuous, can be readily drained on straining filters, and possesses a high nitrogen content.

The scope of this inquiry has been up to the present largely confined to laboratory investigations, and while the results obtained have shown conclusively that the purification process can be readily maintained, a large amount of further research is required in order to obtain a thorough knowledge of the character and mechanism of the changes taking place, which will be essential for the efficient control of the process.

The method employed in producing a satisfactory purification of sewage is, however, of so simple a nature that there would not appear to be any insuperable difficulties in translating the experiments described on to a working scale.

In view of the obviously great reduction in the area of works required and capital expenditure involved, the available data in regard to the probable cost of aëration is such as to lend encouragement to the idea that the adoption of aëration methods on the lines of these experiments would result in a considerable reduction in the total cost of sewage purification. In this connection it may be reasonably anticipated that the enhanced value of the resultant sludge should at least cover all costs incidental to its disposal.

Rubber Paving in the City of London.—Permission has been granted by the City of London Corporation to the acting agent of the Federated Malay States Government to lay an experimental strip of rubber paving in Cannon-street.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride lane, Fleetstreet, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

The work sheets are invited to the following questions.

409. Road Construction.—Give a specification for the conversion of a macadam into a granite sett paved road suitable for heavy commercial traffic. (Urban.)

410. Removal of Sand Bar.—A certain stream carrying discharges into the sea has become silted up, and stagnant at its mouth by the formation of a sand bank 100 yds. by 10 yds. by 3 yds. What steps should be taken to prevent a nuisance, and to insure that the stream will be self-cleansing by the action of the tides? (" Stolidus ")

411. Foundations for Chimney Shaft.—What calculations are necessary for finding the width and depth of concrete for the foundation of a square furnace chimney shaft, 150 ft. in height, on a gravel soil, and built in accordance with the London Building Act, 1894? (Student.)

412. Marine Surveying. Describe a method for obtaining the direction and velocity of tidal currents.

413. Applied Mechanics.—Sketch and describe a Prony brake, and state for what purpose and how it is used.

414. Strength of Materials.—Prove the formulæ $\frac{M}{I} = \frac{f}{y}$ and $\frac{M}{EI} = \frac{1}{r}$ with respect to beams, and explain the meaning of the symbols used.

REPLIES TO QUESTIONS.

405. Disinfection.—Sketch and describe a form of steam disinfector suitable for use in a town of 30,000 inhabitants.

Figs. 1 and 2 give an elevation and plan of a high-pressure steam disinfector, which has been found very effectual in actual practice. It is a type which has been extensively supplied by Manlove, Alliott & Co., Limited, of Nottingham.

Steam at a high pressure is supplied from a 4-h.p. boiler of the vertical type. It enters the steam separator as shown, thus ensuring that the steam

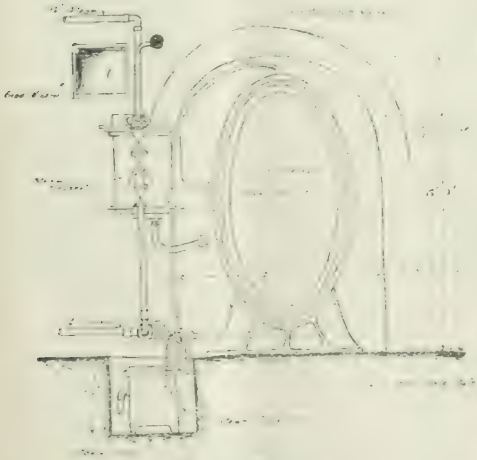


FIG. 1.—ELEVATION.

shall be perfectly dry when it enters the disinfector. The steam is then circulated around the disinfector in a coil of pipes, and leaves at the base by means of the 1½-in. exhaust pipe.

The infected goods are placed on specially constructed stands on one side of the disinfector, and these are then closed in. The two antagonistic doors, each having a wheel fitted to it which runs on the steel runners as shown, are then securely stationed on the other side of the partition wall.

Steam is circulated for about ten minutes or more closed, and steam is admitted by the attendant (according to the condition of the infected goods).

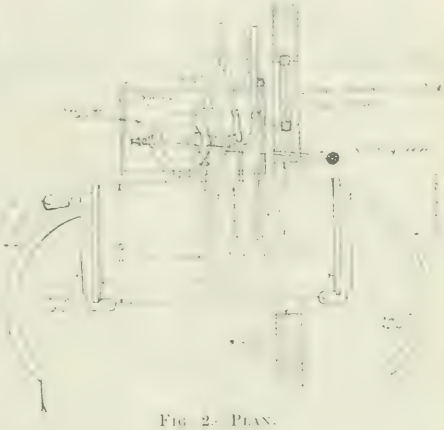


FIG. 2.—PLAN.

after which the supply is cut off, and the goods removed and hung up for drying.

After the disinfector has been fixed in position the space between the arch and the disinfector must be filled in with brick, and a layer of felt placed between the disinfector and the brickwork.

It will be noted that the disinfector is elliptical in section. It is of cast iron, and is firmly secured to a cast-iron base-plate which is strengthened by webs cast on it.

A wood (but preferably iron) cover should be fitted to the steam trap inspection pit, which is formed below the ground level of the building as shown.

A fixed inspection window is placed as shown, and the walls of the building should be of white glazed brick (internally), all corners being rounded off.

The general arrangement, together with the steam-pipe connections, reducing valves, &c., will be quite clear from the sketches. (F. W. P., *Berkhamsted.*)

407. Surveying.—Describe a method of setting out circular curves by means of offsets. (M.C.E.)

Let AB and MN be two tangential portions of a roadway, which it is desired to unite by means of a curve of, say, 1,000-ft. radius.

A common method of procedure is as follows:—

Select a suitable chord as a basis for the calculation of the offsets—say, 50 ft. in the present instance.

The first offset $= \frac{(\text{Chord})^2}{2 \text{ Radius}}$, and succeeding offsets = twice first offset.

Then first offset in present case $= \frac{(50)^2}{2 \times 1000} = \frac{2500}{2000}$ = 1·25 ft., or 1 ft. 3 in.

Produce AB to C, making BC = 50 ft. From C measure off at right-angles to BC a distance CD = 1 ft. 3 in., which will give the first point in the curve. Produce BD to E, making DE = 50 ft., and from E measure off, at right-angles to DE, a distance EF = twice first offset—*i.e.*, = 2 ft. 6 in.—which will give the second point in the curve. This last operation must be repeated until the point L is reached, at which point the first offset—*i.e.*, 1 ft. 3 in.—must be again used in order that the curve may unite properly with the succeeding tangential portion MN.

The offsets in the above figure have been exaggerated for the sake of clearness.

This method is open to the objection that an error results in the laying off of one of the offsets

[illegible] in the succeeding curve. Great care is therefore necessary in laying out the lines, and it is [illegible] to reduce the curve once or twice to [illegible] as possible. (W. A. [illegible])

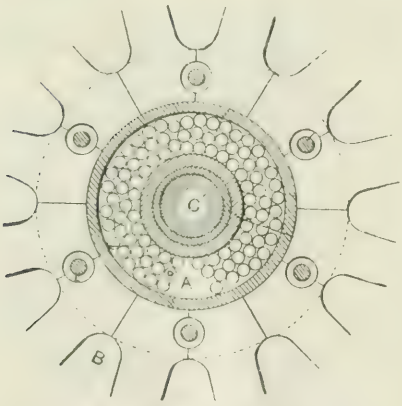
ROAD DAMAGE BY MOTOR 'BUSES AND OTHER VEHICLES.

A RADICAL REMEDY PROVIDED.

(From a Correspondent.)

The [illegible] of Mr. Herbert Samuel, President of the Local Government Board, at the annual conference of the Urban District Councils Association, gives to the ratepayers of the larger public companies and the users of motor vehicles generally throughout the United Kingdom cause for very serious reflection. Mr. Samuel made it quite clear that in future they would require to contribute to the cost of maintaining the roads they use, hitherto generously provided for them free of cost by the utterly overburdened ratepayer. He also stated that the weight of vehicles and all other relative matters would now receive the attention of the technical committee to be appointed for the purpose.

By a decision, last week, at the House of Lords, the principle has been adopted that in future motor-



The "Shock-shifter" Hub.

A Hub loosely filled with steel balls. B Spoke communicating road shock. C The axle. D Point of impact of road shock on steel balls which absorb shock and are forced across vacant space A.

(Space A is exaggerated to illustrate the involved principle.)

'bus companies, at any rate, must pay for road maintenance. A moderate charge upon them of ¾d. per car-mile has been legalised in the Middlesex County Council's Bill. This, it is stated, would absorb some 80 per cent of the present motor-'bus profits. In Lancashire the opinion expressed is that 3d. per car-mile would be a moderate charge on motor 'buses for the damage they do on country roads in that county.

Although clamorous complaint of the destruction of roads everywhere has gone on with increasing momentum ever since the advent of motor traction, it has been little heeded by the road users, who have borne their neighbours' misfortune with "Christian-like fortitude." The past treatment of this important subject again illustrates our national trait of character to ignore trouble even if it does eat into our resources till it sits down permanently upon our doorstep, and demands costly and urgent attention. What is everybody's business is nobody's business" till it touches everybody's tender spot—their pocket.

This national problem has now emphatically done so, and it has become quite clear that it must now be dealt with radically and soundly by Parliament, and that, too, as much in the interest of the road user as the road maintainer.

The Chancellor of the Exchequer last February gave voice to the wails of the ratepayers by declaring the treatment given them to be "irritatingly unjust," and that the subject must come immediately within the range of practical politics.

Some road engineers suggest increasing the depth and solidity of the road foundations, but this would mean an enormous capital outlay estimated by some at a minimum, £30,000,000 sterling, while others suggest that to carry out road reform thoroughly on those lines would involve increasing the National Debt by 50 per cent. By the very solidity of this proposed construction, which inevitably must increase reactionary vibration on the vehicle, there would be a still greater cost of maintenance, which, at its present rate, is the greatest drawback to the economic success of the motor industry, and is most seriously retarding its financial success the world throughout. The consensus of opinion among engineers in the United States is that 15 per cent of the total cost of maintenance is due to this cause. Think of it! Nine shillings out of every £1 spent lost thereby! Honestly analysed, aggregate financial loss and disappointment as yet is the accruing result to the community at large from the motor industry in the present stage of its development. Improvement there must be.

Some experts consider than an elastic tar or bituminous carpet have their advantages, but there must ultimately be produced therefrom an irregular surface, aptly described in some cases as "a rough, petrified sea."

The ultimate and profitable solution of the problem must be to remove the dominant cause of road damage. Thought, nevertheless, has been largely concentrated on how to resist it at an ever-increasing and overwhelming cost. True, hundreds of thousands of pounds have been spent on ingenious and costly devices, because every thinker on the subject recognises that the excessive vibrations set up by the hammer-like action of the axle are destructive alike of road and vehicle. Failure, writ large, was the result till a very simple plan was tried of surrounding the axle of vehicles with a fluid steel ring, which consists of loosely packed, superimposed steel balls filling the hub. The weight of the vehicle itself causes centrifugal action among these, making a "clean cut" of vibration, away from the axle, and, strange fact, actually utilising the road shock to a large extent in propulsive effort, as is proved by a saving of 12½ per cent in petrol, 2 per cent in lubricants, over 20 per cent in gear oil, and 6 per cent in grease, certified by the London General Omnibus Company. At the same time the wheel is maintained in true rolling contact on the ground. Mark that important fact. "Whatever reduces shock to the road also reduces the reaction on the road, which is the main cause of road wear," is the dictum of our most eminent practical authority.

Some years' road experience of the device mentioned on the most crucial of all vehicle tests, by the London General Omnibus Company, the largest users of motor traction in the world, resulted in their certificate that it had given "every satisfaction." This was heartily endorsed by the public, who found the comfort of riding such that letters could be satisfactorily written while travelling, and that road tremor, so destructive of their property, was also overcome.

To "shift" the "shock" and relieve the vehicle owner from vibration—the greatest enemy of his financial progress—and from the backs of the ratepayer and taxpayer by reducing cost of road maintenance to them, is the object of this device, which has consequently been named the "Shock Shifter."

The *Times*, commenting upon the invention, says:—

"Road shock is converted into rotary motion, because the power arising from the obstacle itself is actually harnessed to do this work, and as reactionary shock is thus avoided, vibration is successfully overcome."

It is the application for the first time in wheel construction of a sound basic natural law governing the right use of force, the efficacy of which no sound thinker can contest.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Ashton-under-Lyne (July 17th. Mr. A. W. Brightmore).—£14,200 for the improvement of the sewage disposal works. Mr. J. Rowbottom, of Ashton, engineer of the scheme, gave details of the proposed alterations and improvements, after which the inspector visited the works.

Bath R.D.C. (July 9th. Mr. H. Shelford Bidwell).—£3,000 for works of sewerage and sewage disposal.—The Wilts County Council and the Bradford-on-Avon Rural District Council made an application to the inspector during the course of the inquiry that, as the proposed outfall works for Freshford were to be constructed in the county of Wilts, the loans should be given for dealing with the sewage of Limpley Stoke in that county on the same site. Mr. J. E. Willcox explained the scheme and pointed out there would be no engineering difficulties in according to the request provided suitable terms could be arranged with the Bath Rural District Council. Mr. Whittington, the clerk to the council, informed the inspector that they would be willing to consider the proposal.

Bishop Auckland U.D.C. (July 13th. Mr. R. H. Bicknell).—£700 for a grandstand and cowing screen on the recreation ground. Upon learning that the council had already spent £300 on the works, the inspector declared that there was no justification, except under extraordinary circumstances, for anticipating the sanction of the Local Government Board. The necessary plans were submitted by the surveyor, Mr. T. Collins. The inspector suggested certain alterations to the plans with regard to the public convenences which would mean an addition of £100 to the amount applied for, and he advised the council, if they agreed, formally to pass a resolution, at the next meeting and send it to the Local Government Board, and the amount would probably be added to the loan.

Bournemouth T.C. (July 15th. Mr. W. O. E. Meade-King).—£650 for the construction of a relief sewer through the Portman estate, and £350 for surface-water drainage at Moordown. The proposed sewer, it was explained, was intended to relieve the sewer in the lowest part of Parkwood-road, there having been cases of flooding in that district.

Llandudno U.D.C. (July 16th. Mr. H. A. Chapman).—£4,855 for the purpose of a housing scheme.—The deputy surveyor, Mr. W. T. Ward, submitted the plans of the proposed dwellings, and the financial statement showed that at 7s. 3d. a week and 6s. a week for houses with three and two bedrooms respectively the rents would just about cover the cost of the interest on and redemption of the loan, if it were paid off in sixty years.

Warrington T.C. (July 10th. Mr. Edgar Dudley).—£1,419 for the purchase of property in connection with the widening of Cockhedge-lane, Knutsford-road and Oliver-street. It was explained that the most important of the proposals was that relating to Knutsford-road, where the traffic had increased enormously, and the corporation had steadily pursued a scheme for the widening of the thoroughfare to a uniform width of 60 ft. Up to the present time they had reached the Bridgwater Canal, where the road suddenly narrowed, and was carried over the canal by a bridge only 26 ft. wide.

APPLICATIONS FOR LOANS.

Bourne U.D.C.—£15,000 for the purchase of the local gasworks.

Branston R.D.C.—£15,689 for the Boultham and Swallowbeck sewage disposal scheme.

Chadderton U.D.C.—£700 for laying out a recreation ground.

Cleethorpes U.D.C.—£10,000 for electrical cables.

East Stow R.D.C.—£1,972 for works of water supply.

Goole R.D.C.—£1,200 for works of water supply.

Langport U.D.C.—£1,700 for the erection of dwellings.

Maidstone T.C.—£600 for a site for workmen's dwellings.

Rye T.C.—£300 for the extension of the municipal buildings.

Saffron Walden R.D.C.—£6,500 for working-class dwellings.

Skipton U.D.C.—£8,700 for the extension of the sewage disposal works.

Warminster R.D.C.—£2,000 for the Chitterne housing scheme.

Warwick T.C.—£1,000 for improvements at the sewage disposal works.

Widnes T.C.—£300 for the extension of the refuse destructor.

LOANS SANCTIONED.

Barnsley T.C.—£4,000 for stoneware sewerage and surface-water drainage.

Colwyn Bay U.D.C.—£1,600 for the purchase of land for housing purposes.

Dublin T.C.—£80,300 for the electricity undertaking.

Foleshill R.D.C.—£1,067 for street improvement.

Grimsby T.C.—£1,733 for street works.

Fleetwood U.D.C.—£387 for street improvement.

Mansfield T.C.—£8,000 for gas mains and meters.

Northam U.D.C.—£6,500 for Appledore marine parade, quay, and sewerage scheme.

Paignton U.D.C.—£4,000 for laying out a portion of the foreshore at Preston, and for the erection of seats and shelters thereon, and for £1,600 for conveniences and drainage, the £4,000 to be repaid in twenty years, and the £1,600 in thirty years.

Rochdale T.C.—£12,500 for the purchase of a site for a sanatorium.

Slough U.D.C.—£380 for sewerage works.

Southall-Norwood U.D.C.—£5,561 for the purchase of sites in Western-road and Norwood-road for the erection of workmen's dwellings.

Sowerby U.D.C.—£4,082 for sewerage works.

Winchcombe R.D.C.—£2,000 for housing schemes.

Worcester T.C.—£10,300 for a new school.

FORTHCOMING INQUIRIES.

JULY.

		£
27.	**Banbury.** For the provision of a depot (Mr. W. O. E. Meade-King)	1,150
27.	**St. Ives.** For a housing scheme (Mr. Courtenay Clifton)	2,050
27.—	**Southall-Norwood.** For surface-water drainage (Mr. F. H. Tulloch)	1,850
27.—	**Wimbledon.** For works of private street improvement (Mr. R. H. Bicknell)	1,810
28.—	**Barmouth.** For the provision of pleasure grounds (Mr. H. R. Hooper)	2,300
28.—	**Brighton.** For the purposes of street improvement (Mr. Edgar Dudley) ..	9,470
28.—	**Brixham.** For a housing scheme (Mr. H. A. Chapman)	3,810
28.—	**Cardiff.** For works of water supply (Mr. P. M. Crosthwaite)	50,197
28.—	**Feckenham.** For a housing scheme (Mr. C. H. Eyles)	1,940
28.—	**Leiston.** For a housing scheme (Mr. Courtenay Clifton)	10,856
29.—	**Great Torrington.** For a housing scheme (Mr. H. A. Chapman)	1,100
29.—	**Llanelly.** For works of street improvement (Mr. P. M. Crosthwaite)	2,880
29.—	**Pebworth.** For a housing scheme (Mr. C. H. Eyles)	2,275
29.	**Stroud.** For the provision of stables (Mr. W. O. E. Meade-King)	1,650
29.—	**Woking.** For works of sewage disposal (Mr. A. W. Brightmore)	18,600
29.—	**Ynyscynhaiarn.** For the purposes of the gas undertaking (Mr. H. R. Hooper)	1,725
30.—	**Deptford.** For the erection of slipper baths (Major J. Stewart)	1,500
30.	**Evesham.** For a housing scheme (Mr. C. H. Eyles)	3,930
30.—	**Prestatyn.** For works of water supply (Mr. H. R. Hooper)	3,100
30.	**Romford.** For the purchase of property for street improvement (Mr. Edgar Dudley)	3,400
31.—	**Maidstone.** For bridge reconstruction (Mr. A. W. Brightmore)	3,000

TOWN PLANNING.

JULY.

29.—	**Lincoln.** (Mr. George L. Pepler) ...	—
30.—	**Yarmouth.** (Mr. George L. Pepler) ...	—

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Brighton £22,000, Margate, St. Annes [illegible] Bay; Wrexham, roads and materials—Barnsley £12,000; Portsmouth £200,000; sewerage and sewage disposal—Branston £15,689; water, gas and electricity—Ashton [illegible]. Particulars of other works projected will be found in the "Local Government Board Inquiries" page.

BUILDINGS.

Barnsley T.C.—The Hospital Committee have instructed the borough surveyor, Mr. J. H. Taylor, to prepare sketch plans and to make an estimate of the cost of a new isolation ward, also a central heating system for the whole hospital, with the consequential increase of the administrative block.

Blackrock (Co. Dublin) U.D.C.—The council have approved the plans submitted by the electrical engineer for the erection of a generating station, and these are to be forwarded to the Board of Trade.

Blairgowrie T.C.—The Property Committee recommended the council to approve of a scheme of alterations at the public baths at a cost not to exceed £2,500.

Bournemouth T.C.—The borough surveyor, Mr. F. W. Lacey, is preparing a report upon the scheme for public baths on land intended for a new recreation ground.

Brighton T.C.—Competitive designs are being invited for carrying out improvements at the Aquarium, at a cost not exceeding £22,000.

Cheltenham T.C.—Certain properties on the Promenade are to be converted into municipal offices, at an estimated cost of £5,574.

Cornwall C.C.—It is proposed to carry out alterations to the laundry at the county asylum, at an estimated cost of £700.

Cramlington U.D.C.—It has been agreed to provide a municipal depot, at an estimated cost of £750.

Galashiels T.C.—A scheme is being considered for the extension of the burgh buildings, and Sir Robert Lorimore has been asked to submit estimates for the work.

Herts C.C.—It has been agreed to purchase 86 acres of land contiguous to the Letchworth estate for the purposes of a sanatorium and hospital.

Margate T.C.—A proposal is being considered for the purchase of property on the sea front for the purpose of municipal offices.

St. Annes-on-Sea U.D.C.—A scheme has been approved for the erection of open-air baths and pavilions on the sea front, at an estimated cost of £[illegible],000.

Stonehaven T.C.—The burgh surveyor has prepared plans for the widening of the bridge at Cowie by 14 ft., at an estimated cost of £700, and the matter has been referred to the Streets and Footpaths Committee for report.

Wellington U.D.C.—The surveyor, Mr. G. Riley, has prepared a plan of a public convenience in Station-road, the cost of which he estimates at £150.

HOUSING AND TOWN PLANNING.

Abersychan U.D.C.—Consideration is being given to a scheme for the erection of fifty additional workmen's dwellings.

Brechin T.C.—The Property Committee have been asked to consider a scheme for converting model lodging-houses into artisans' dwellings, at an estimated cost of £700.

Colwyn Bay U.D.C.—The surveyor, Mr. William Jones, has prepared a housing scheme on garden city lines, which has received the sanction of the Local Government Board. The estimated cost is £20,000.

Coventry T.C.—The accounts of the Housing Committee for the year ended March last show a profit of £29, as compared with a profit of £6 for the previous year.

Dewsbury T.C.—A housing scheme, estimated to cost £24,000, has received the sanction of the General Purposes Committee.

Horsham R.D.C.—Official approval has been given to a housing scheme for Cowfold, which it is proposed to carry out at an estimated cost of £1,500.

Mansfield T.C.—A plot of land in Baum's lane is to be purchased for the purpose of a housing scheme. It is estimated that the street work will cost £425.

Norwich T.C.—The city engineer, Mr. A. E. Collins, has received instructions to prepare plans and specifications for the Starling-road housing scheme for about 115 people.

Southall-Norwood U.D.C. — The surveyor, Mr. Reginald Brown, has prepared a report upon a proposed housing scheme upon, alternatively, one of two parcels of land bounded on the west by Western-road, the south by the Common-road, and the east by the recreation ground. The larger site consists of about 9¼ acres, and the smaller area of about 4¼ acres. Mr. Brown suggests that a scheme should be prepared which provides for various classes—*i.e.*, at different rents and with different accommodation, somewhat proportional to the rent to be charged. The rents, he suggests, should vary from 5s. 6d. to 8s. 6d. per week, the larger number being 7s. 6d. per week. With regard to the accommodation to be provided, he has prepared several sketch plans as follows: Class A, accommodation, living-room, scullery and two bedrooms, suggested rental 5s. 6d. per week; Class B, as A, but slightly larger, 6s.; Class C, living-room, scullery, and three bedrooms, 6s. 6d.; Class D, as C, but slightly larger, 7s.; Class E, parlour, living-room, scullery, and three bedrooms, 7s. 6d.; Class F, as E, but slightly larger, 8s.; Class G, as E, but slightly larger and different plan, 8s.; Class H, as G, but slightly larger, 8s. 6d. Each house, no matter what class, is provided with a bath in addition to the usual conveniences. Mr. Brown, in submitting the report to the council, referred to the valuable assistance he had received from his assistant, Mr. Thomson, in preparing the plans.

Spalding R.D.C.—A letter has been received from the Local Government Board declining to sanction a loan for the erection of working-class dwellings in the parish of Pinchbeck. The loan was refused on the ground that the design was for a too expensive house, and that the drainage scheme was insufficient. The Board asked for revised plans on a more economic basis. They intimated that they were agreed as to the necessity for houses in the parish, and they also approved of the sites selected. It was understood that revised plans would be submitted, but the council took objection to the drainage scheme on the ground that it was unnecessary.

Wrexham R.D.C.—The council have decided to apply for sanction to the borrowing of money for the purpose of acquiring land at Johnstown, and building thereon forty-four houses, estimated to let on an average of 5s. 9d. per week inclusive. The scheme comprehends the erection ultimately of sixty-five houses, at a cost of about £13,000, including land, buildings, street making and sewering.

PARKS AND OPEN SPACES.

Bushey U.D.C.—The surveyor, Mr. E. E. Ryder, has received instructions to prepare alternative plans for shelters, tennis courts, and fences at the recreation ground.

Darwen T.C.—The disposal of the bequest to the town of £10,000 by Alderman Lightbown was discussed recently, and a resolution was passed requesting the trustees to consider the question of providing playing fields for the borough.

REFUSE COLLECTION AND DISPOSAL.

Greenwich B.C.—The council have appointed a representative on a joint committee of riverside boroughs which is to consider the question of combination for the purpose of the disposal of refuse. The council have also instructed the Highways Committee to consider and report as to the desirability of adopt-

ing the system of dealing with refuse by crushing, now in use at Southwark, Glasgow, Hove, and other places.

ROADS AND MATERIALS.

Argyll C.C.—The surveyor to the Lorn District Committee has received instructions to report upon alternative routes for the proposed road beween Ballachulish and Kinlochleven.

Barmouth T.C.—The council contemplate an extension of the marine parade, at an estimated cost of £12,000.

Cork T.C.—A scheme has been approved for asphalting in Paulstreet, St. Peter's-place, and St. Paul's-place.

Glamorgan C.C.—A letter has been received from the Road Board stating that, subject to certain details being approved by them, they were prepared to contribute £23,000 towards the cost of various main road improvements proposed to be carried out by the county council at an estimated cost of £120,000. The county surveyor, Mr. G. A. Phillips, reports that the average cost of road maintenance per mile, including tar-spraying and watering, amounted to £220 for the year, compared with £223 for the previous year.

Looe U.D.C.—A scheme is under consideration for effecting extensive improvements in the streets.

Newhaven R.D.C.—The surveyor, Mr. Arthur C. Groves, reported that the Seaford-Newhaven road, which had previously been in a very satisfactory condition, was now badly cut up owing to extraordinary traffic, and he advised that the council should consider the question of treating it in a manner to deal with the additional traffic by laying a more solid foundation. The matter was referred to the Highways Committee.

Portsmouth T.C.—A scheme has been approved for a new road out of Portsmouth, at a cost, for works within the borough, of £120,000, and outside the borough of £80,000.

Queen's County C.C.—The council decided recently to appoint an additional assistant surveyor.

SEWERAGE AND SEWAGE DISPOSAL.

Branston R.D.C.—A sewage disposal scheme, estimated to cost £15,689, has been adopted for the eastern part of Boultham and the eastern part of Swallowbeck.

Caerphilly U.D.C.—For the new sewage disposal works an order has been placed for six Adams' patent "Cresset" revolving sprinklers, with Adams-Hydraulics, Limited, of London and York. The engineers for the scheme are Messrs. Willcox & Raikes, of Birmingham, and the contractor Mr. Buckley, of Bradford.

Clown R.D.C.—The surveyor, Mr. J. T. Pears, has received instructions to prepare plans for an improvement at the sewage outfall works.

Foleshill R.D.C.—A sewage disposal scheme for Exhall is to be considered by the council at an early date.

Goole U.D.C.—The tender of Messrs. F. E. Binns & Co., of Croydon, at £10,722, has been accepted for work in connection with the sewerage scheme, and the tender of Messrs. Herbert Morris, of Loughborough, at £122, for the erection of a traveller at the sewage pumping station.

Hemsworth R.D.C.—The tender of Adams-Hydraulics, Limited, has been accepted by the council for the supply and erection of two 100-ft. sprinklers, and other fittings required on the extension to the South Elmsall sewage works, where "Cresset" sprinklers have already been in use for several years with much success.

Higham Ferrers T.C.—The tender of the Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, has been accepted for the supply of their patent "Simplex" rotary distributors for the new sewage disposal works about to be constructed.

Liversedge U.D.C.—The council at their last meeting accepted the tender of the Ames-Crosta Sanitary Engineering Company, Limited, for the supply of various ironwork in connection with the extensions to their sewage disposal work, which include eight of their well-known patent "Simplex" rotary distributors, each 100 ft. diameter.

Oswestry R.D.C.—The council have instructed Messrs. Berrington, Son & Watney to prepare a scheme for the sewerage and sewage disposal of Ifton Heath and St. Martins.

Portslade U.D.C.—The council have approved the revised estimate of the cost of the surface-water drainage scheme, amounting to £4,000 approximately, and the clerk has been instructed to advertise for tenders.

Sandgate U.D.C.—The council have passed a resolution inviting the Folkestone council to connect their sewerage system with their (the urban council's) outfall, so as to save the construction of two outfalls.

Surbiton U.D.C.—On Monday the council were able to settle the vexed question of the claims made by Messrs. Dick, Kerr & Co., Ltd., with regard to "deferred extras" under Contract No. 3 of the Surbiton sewerage works. Thirty-two items were included in the firm's claim, and they were offered £2,500 in full settlement. This they were unable to accept, but offered to take off all their profit, and to settle for £4,500. Finally they agreed to take £3,500, and on Monday a cheque for that amount was drawn, litigation being thus avoided.

Swansea T.C.—It has been decided to affix sewer ventilators at the docks and near the Cricketers' Hotel, as an experiment.

WATER, GAS, AND ELECTRICITY.

Ashington U.D.C.—The Water Committee recommend the council to proceed to obtain Parliamentary powers to utilise Tosson Springs for a supply of water for the district so soon as the council are assured that such a Bill could be successfully promoted. The cost of the scheme is stated to be approximately £65,000.

Bodmin R.D.C.—The Local Government Board have sanctioned an expenditure of £20 in connection with preliminary investigations with respect to a water supply scheme for North Cornwall.

Carlisle T.C.—The nett profit of the gas undertaking last year was £589, as against £8,608 the previous year. The contributory causes of the falling off were a reduction in the price of gas by 3d. per 1,000 cub. ft., and the increased cost of coal amounting to £2,629.

East Grinstead U.D.C.—The council on Monday decided to apply next December to the Board of Trade for a Provisional Order for the supply of electricity for public and private purposes.

Hammersmith B.C.—It has been agreed to fix the charge for the supply of current to, and maintenance of, electric lamps for public lighting in side streets at the rate of £2 7s. per lamp per annum. It has also been decided to convert seventy gas lamps in various streets from gas to incandescent electric light, at an estimated cost of £227.

Llandudno U.D.C.—The working of the electricity undertaking produced last year a nett profit of £462.

Oswestry R.D.C.—The council have received the sanction of the Local Government Board to the scheme for extending the water supply of Weston Rhyn, and Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, the consulting engineers to the council, have been instructed to obtain tenders for the carrying out of the work.

Southmolton R.D.C.—The tender of Mr. Peter Govier, of Southmolton, at £269, has been accepted for the construction of filter-beds at Chulmleigh in connection with the water supply.

Withernsea U.D.C.—An agreement has been reached with the Hull Corporation for a supply of water.

MISCELLANEOUS.

Douglas (Isle of Man) T.C.—The Highways Committee are giving consideration to the provision of motor cars for fire purposes.

FOR OTHER ADVERTISEMENTS
See End of Paper.

ASSISTANT (26), A.M.Inst.M. & Cy.E., Cert. R.San.I. Shortly disengaged. Eight years' experience as pupil and assistant in rural districts; two years resident on £20,000 sewerage and sewage disposal works. Surveying, levelling, specifications, quantities, building construction, sewerage, waterworks, highways, &c. Neat draughtsman. Accept small salary in good district.—Box 1,449, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,814)

THE URBAN DISTRICT COUNCIL OF HASLEMERE, SURREY

HIGHWAYS FOREMAN.

The Urban District Council of Haslemere invite applications from persons not exceeding 40 years of age for the post of Working Highways Foreman.

Candidates must be cyclists and possess a bicycle, and must have had practical experience in road tarring and the construction of highways with tarred macadam. They must also be competent to lay out work and paving keep time books, and generally supervise the work of construction, repair, and maintenance and cleansing of highways.

Forms of application and particulars of the appointment can be obtained upon receipt of stamped addressed envelope.

(By order)

A. G. WHITCHER,
Clerk to the Council.

Council Offices,
Haslemere.
July 22, 1914. (1,813)

CHERTSEY RURAL DISTRICT COUNCIL

BYFLEET AND PYRFORD SEWERAGE.

The above-named Council invite Tenders from responsible Contractors for extensions at their Outfall Works.

The work comprises construction of Two Circular Bacterial Filters, 80-ft. diameter, containing a total of 2,218 cubic yards of destructor clinker, also a 30-in. Rising Main, with all pipes and appurtenances.

Plans and Specifications can be seen at the offices of the Engineers, Messrs. Elliott & Brown, Assoc.M.Inst.C.E., Council Buildings, Parliament-street, Nottingham, after the 1st day of August, and copies of the Specification, Bills of Quantities and Form of Tender obtained from them on deposit of Two Guineas (by Cheque), which will be returned on receipt of a *bona-fide* Tender not afterwards withdrawn, and return of all documents.

A copy of the specification can be inspected at the office of the Surveyor, Mr. H. Berney, Bailey Lodge, West Byfleet.

Sealed Tenders endorsed "Tender for Filter Beds," to be delivered to the undersigned not later than 1 p.m. on Tuesday, 18th August, 1914.

The lowest or any Tender will not necessarily be accepted.

By order,

H. E. PAINE,
Solicitor and Clerk to the Council.

Chertsey, Surrey.
July 25, 1914. (1,811)

THE RURAL DISTRICT COUNCIL OF RUNCORN.

GRAPPENHALL, LATCHFORD WITHOUT, AND THELWALL SEWERAGE.

The time for receipt of Tenders is extended to Friday, the 21st day of August, 1914.

GEO. F. ASHTON,
Clerk to the Council.

Runcorn.
July 22, 1914. (1,812)

TWICKENHAM URBAN DISTRICT COUNCIL.

MOTOR FIRE ENGINE AND ESCAPE.

The above Council hereby invite Tenders for the Supply and Delivery of a 400-450 gallon Petrol Motor Fire Engine, complete with Pump, 50-ft. Fire Escape and First Aid Equipment.

Further particulars and Form of Tender may be obtained on application at the Office of Mr. Fred. W. Pearce, Engineer and Surveyor to the Council, Town Hall, Twickenham.

Sealed Tenders, endorsed "Tender for Motor Fire Engine," to be delivered to the undersigned not later than noon on Wednesday, the 12th day of August, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

H. JASON SAUNDERS,
Clerk to the Council.

Town Hall,
Twickenham.
July 22, 1914. (1,815)

PERSONAL.

Mr. John Lloyd, surveyor to the St. Asaph (Flint) Rural District Council, has received an increase of salary of £10 a year.

Mr. G. Strutt, surveyor to the Dodworth Urban District Council, has been appointed clerk of the works for the new municipal offices scheme.

Mr. D. Mort, surveyor to the Lymm Urban District Council, has been granted clerical assistance owing to the increase of his professional work.

Mr. Herbert Samuel, President of the Local Government Board, has promised to give the inaugural address to the members of the Summer School of Town Planning on Monday evening, August 3rd. The course will be held in the School of Architecture at University College from August 3rd to 15th.

Mr. A. Gladwell, surveyor to the Eton Rural District Council, has been placed on the committee of the Institution of Municipal and County Engineers appointed to prepare and give evidence before the Departmental Committee of the Local Government Board on the question of the working of the building by-laws.

Mr. C. G. Mason, as already announced in these columns, has resigned his position as borough surveyor of Guildford after eighteen years' service. Prior to the appointment of a successor, the work of the department is being carried on by Mr. G. A. Ballard, Assoc.M.Inst.C.E., the assistant borough surveyor, with the help of Mr. O. L. Cole, Stud.Inst.C.E., the second assistant.

Mr. C. O. Baines, since you to the Paignton Urban District Council, has, we regret to state, suffered an irreparable loss by the death of his wife. One of Mrs. Baines' last public acts was to entertain at tea in December last the members of the South-Western District of the Institution of Municipal and County Engineers. The Paignton Council have passed a vote of condolence with Mr. Baines, and granted him leave of absence.

Messrs. A. Lupton, engineering assistant to city engineer, Leeds, S. D. Meadows, engineering assistant to borough engineer, Ipswich, and G. A. Waite, engineering assistant to borough surveyor, Rochdale, have been elected associate members, and F. H. G. Stockdale, county surveyor's office, Frome Rural District Council, A. Carstairs, burgh engineer's office, St. Andrews, R. W. H. Vallis, surveyor's office, Frome Rural District Council, E. W. H. Vallis, assistant surveyor, Langport Rural District Council, J. Parkin, town surveyor's office, Buxton, and H. R. Hayes, assistant surveyor to the Southport Water Board, students of the Institution of Municipal and County Engineers.

Lord Headley was on Friday of last week present at the White City, where a gathering of Mohammedans resident in London had been arranged, and there were prayers by the Imam of Woking Mosque, and lectures on Mohammedanism. Saifurrahman Shaikh Rahmahillah Farvoq is the name Lord Headley adopted with his new faith at the end of last year. As Mr. R. G. Allanson-Winn he had a distinguished career as a civil engineer, and was a fine all-round sportsman in his time. When he was up at Cambridge he won the heavy and middle weights, and Jem Mace once said of him, after seeing him spar, that with training he would make one of the finest boxers of the day. He has contributed frequently to The Surveyor, mainly on foreshore protection, on which he is a widely known expert.

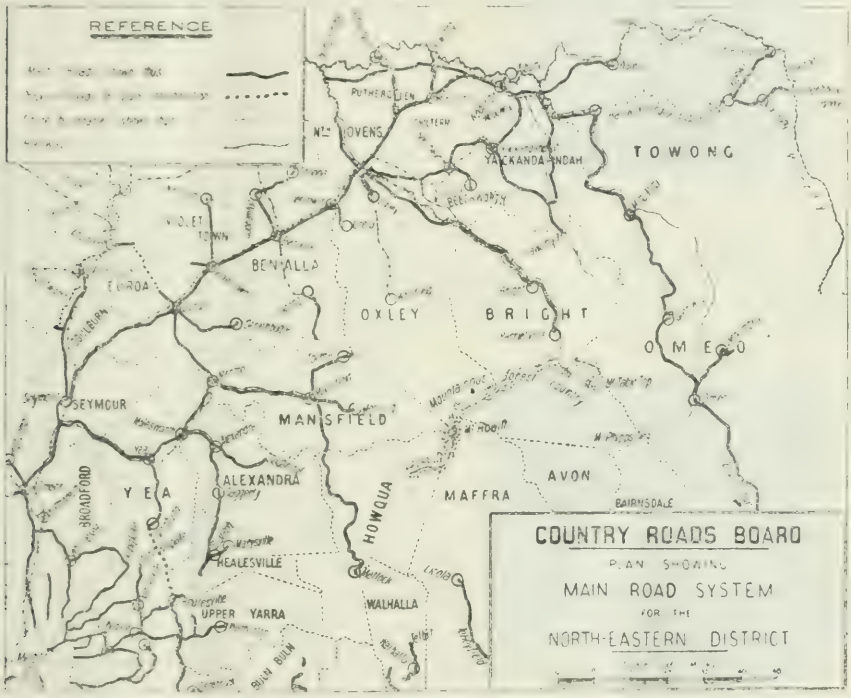
Mr. G. S. Coleman, Assoc.M.Inst.C.E., Manchester, has been successful in obtaining the degree of Doctor of Science in engineering at the University of London. Until last February he was engineering assistant in the city surveyor's office, Manchester. It is believed that he is the first municipal engineer to win this distinction, at any rate by examination, and in a purely municipal subject—namely, the discharging capacity of storm overflows, and the discharge of rain storms in sewers. There are now only four students of the university holding the external degree and two internal, and it is possible that the external degree may be abolished in the near future if the recommendations of the Royal Commission are accepted. Mr. Coleman's thesis was much praised by the examiners, who thought that the results were extremely valuable.

COUNTRY ROADS BOARD OF VICTORIA.

DEVELOPMENT OF NORTH-EASTERN AREA.

The accompanying map of the proposed main road development in the North-Eastern district of Victoria, Australia, which has been prepared by the Country Roads Board, of that State, was considered by the State Cabinet on the 4th ult., and was made available for perusal by the Minister for Public Works, Mr. Hagelthorne.

It is understood that the proposals of the board for the North-Eastern district will involve an ultimate expenditure of something over £300,000. Speaking with reference to this matter, Mr. Hagelthorne pointed out that fully eighteen months must elapse before the money voted for the work of road construction could be absorbed, by which time any Government which happened to be in power would no doubt recognise the good work the board was doing, and vote whatever further money was necessary to carry on the road development. These districts which had yet to be visited by the Roads Board would not be prejudiced to any degree by the large expenditure involved in the North-Eastern division.



HEAVY MOTOR TRAFFIC AND ROAD MAINTENANCE.

At the annual meeting of the Urban District Councils Association, Mr. Herbert Samuel, President of the Local Government Board, in an opening address made a reference to the regulation of heavy motor traffic and its liability to contribute towards the cost of road maintenance.

Mr. Samuel said the time had clearly come for a review of the situation in regard to heavy motor cars and omnibuses and their contribution to the maintenance of roads. He was appointing a committee, consisting mainly of engineers, to suggest alterations which might be necessary in the regulations of the Local Government Board relating to the weight of the vehicle and the width of the tyre and similar matters. In addition, a Select Committee would be appointed in order to consider the whole position with regard to motor omnibuses and trolley vehicles running in the neighbourhood of great corporations. The question was whether these services should pay to the upkeep of the roads, and, if so, how much. The position was complicated by the fact that, while a corporation, if it came to Parliament for powers to establish omnibus and trolley-vehicle services, could be required by law to contribute in respect of the damage done to the roads, any company or private individual could start such services without any statutory powers, and without having to make any contribution.

Empress Works, Loughborough. From August 3rd to 11th next the works of Messrs. Herbert Morris, Limited, will stop for stock-taking and overhaul of plant. The offices will close for the yearly holiday. A limited number of the staff will be in attendance to deal with urgent matters. Orders for pulley-blocks and other stock articles will be executed from stores as usual.

A Glossary of Road Terms. By H. Percy Boulnois, M.INST.C.E. Price 2s. nett. The St. Bride's Press, Limited, 24 Bride-lane, E.C.—The compiler of this road vocabulary says in his modest introduction: "Someone had to make a start," and it cannot be denied that with the thousand and more words he has collected a very good start has been made. . . Every reader of the glossary will recognise the industry of which proof has been given in its compilation, and due credit will be awarded for the courage and independence shown in the definition of some terms which have hitherto been the subject of much heated discussion.—*Sanitary Record.*

Business Announcement.—Claridge's Patent Asphalte Company, Limited, announce that they have opened an agency in Manchester to cope with the work in the North Midlands District. Their representative is Mr. E. J. Thompson, of 36 Spring Chambers, Manchester.

New Building Regulations for Council Schools.—The Board of Education on Saturday issued new regulations for the planning, erection and fitting up of new elementary schools in England. The new regulations replace those issued in 1907, and the chief changes relate to design as affected by ventilation, to disposition of buildings on the site, to size and organisation of departments, and to extent and character of facilities for physical exercises, play, and organised games, whether for older or younger children.

NEW DEVICE FOR TAR-PAINTING OF ROADS AND FOOTPATHS.

[illegible] Patent Scarifying Co., and M. [illegible] of [illegible] N.S.W., in [illegible] scarifying a patent pail for [illegible] tar-painting purposes. It is the invention of Mr. S. [illegible], surveyor to the Willoughby Urban District Council, and is [illegible]

Pail with Inventor's Spout on Tar-boiler

to make it possible for the surveyor having a pitch boiler to undertake tar-painting successfully, and at a very small cost in appliances.

The method of working is very simple. The pail is filled with tar at the proper heat, and the man carrying the pail turns on the tap, which allows the tar to run through the bottom of the pail on to a

Cone Fed from Tar-boiler

[illegible] distributing it in a perfectly even film of a width of 18 in. on to the surface of the road. The man in charge of the pail has simply to walk backwards and forwards, and the tar is delivered so close to the surface of the road that it retains sufficient heat to allow the men who follow immediately behind with brooms easily to brush forward any surplus tar. The saving in this respect is stated to be very considerable, and sloppy work is avoided in consequence.

This device may have a continuous feed from the pitch boiler, as shown in the accompanying photographic views, the attachment being made to the tap by means of metallic tubing of sufficient length to allow the distributor to work more than halfway across the road; the other end of the metallic tubing being screwed to the bottom of the pail immediately over the cone. This system applies the tar so quickly that the tar-boiler must be practically kept on the move. The boiler is emptied in a very short time, but while waiting for the heating of further supplies the men who have distributed and brushed the tar can be employed spreading grit on the finished portion.

The accompanying views show how the inventor has adapted a pitch-boiler for use with his invention. In order to do the filling easily and quickly he has fixed an arm of 2in. steam piping to the boiler, with endless chain blocks attached for lifting purposes.

It will be at once seen that for tar-grouting these pails supply a long felt want, the evenness of the film making them ideal for the purpose.

We are assured that the whole system will be found very economical both with regard to material and labour, and that the makers will be glad to give further particulars and prices on application.

SOME RECENT PUBLICATIONS.*

Hydraulic Diagrams. Third Edition. By Prof. C. W. L. Alexander, M.Inst.C.E. Price 2s. 6d. nett. Post free from the Author, University College, Cork.

The objects of these charts is to solve all kinds of problems on the flow of water in pipes, sewers, rivers and channels, and over weirs. The method of using them is fully explained by the examples worked out on the folder facing the diagrams. With them questions on compound mains, distribution systems, and drainage plans are simple. The charts have been produced with every regard to convenience in use. Thus, they are printed on handmade paper, the toughest and best material obtainable for this purpose. In mounting them in the cover care has been taken to allow of them being removed therefrom and mounted on cardboard for office use. Further the charts are so drawn that the sheet may be cut into four and the parts mounted separately. No lines have been thickened, in order that engineers may rule up in red ink those lines which they find of most importance in their own special work. The present edition goes much further than its predecessors, inasmuch as it comprises separate charts for water mains, sewers, rivers and large channels, and weirs, respectively. The work is highly recommended by many leading engineers, and as a means of saving labour in calculation leaves nothing to be desired.

Notes on the Valuation of Real Property. By H. G. Lamputt. Price 1s. 6d. nett. London: Crosby, Lockwood & Son.

This little book contains a brief account in summary form of the principles and practice of valuation. It is intended for candidates taking the intermediate examinations of the Auctioneers' and Surveyors' Institutions. Its forty-five pages comprise eight chapters and four appendices, and the subjects dealt with include Principles of Valuation, Valuation of Freehold House Properties, Leasehold Properties, Premiums, Reversions, Outgoings, Valuations of Buildings, and Valuation of Life Interests. The work consists largely of a series of short, practical examples, and as a first or introductory book for young students has much to recommend it. We may say, however, what is obvious, that an adequate and sound knowledge of the subject, even for examination purposes, cannot be gained without supplementing this book by one of the larger and more elaborate treatises.

Scales for Ascertaining the Dimensions of Pipes, Drains and Sewers. By C. E. Housden. Price 1s. 6d. nett. London: Longmans, Green & Co.

These scales are taken from the author's work on "Water Supply and Drainage Systematised and Simplified," and enable the user readily to ascertain the dimensions, to the nearest inch, of pipes, of half-pipes, and of any design of drain or sewer in which a semicircle or circle can be inscribed. The use of the scales is simple and direct, and although reference must be made to the larger work for an exposition of their construction, the method of using them is clearly explained at the beginning of the present work. The use of the fancy words "galmins" and "cusecs" for "gallons per minute" and "cubic feet per second" is a little puzzling, however, until the intelligent reader hits upon their meaning.

Hydraulics. By E. H. Sprague, Assoc.M.Inst.C.E. Price 3s. 6d. nett. London: Scott, Greenwood & Son.

This little book has been compiled chiefly from the author's lecture notes. It comprises the prin-

*** Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.**

[illegible] pipes of fluid pressure, a consideration of liquids on [illegible], discharge [illegible] and weirs, flow in pipes and channels, [illegible] and [illegible] [illegible] and pumps. A [illegible] [illegible] [illegible]

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR'S ASSISTANT.—July 29th. Penty[illegible] Urban District Council. £60—£80.—Mr. J. C. Jones, clerk.

SURVEYOR'S TEMPORARY ASSISTANT.—July 27th. Ilford Urban District Council. £78 per annum.—Mr. F. W. Jones, engineer and surveyor.

COUNTY SURVEYOR.—July 25th. Kildare County Council. £500—£500.—Mr. Thomas Langan, secretary, Courthouse, Naas.

CLERK OF WORKS.—July 25th. [illegible] £2[illegible] per annum.—Mr. A. C. Bowle[illegible], Education Offices, Dublin.

GENERAL FOREMAN.—July 25th.—Corporation of Dunedin.—Mr. A. G. Symonds, town clerk.

ENGINEER AND SURVEYOR.—July 27th.—St. Annes-on-the-Sea Urban District Council. £250 per annum.—Mr. T. Bradley, clerk.

INSPECTOR OF NUISANCES.—July 27th. Northampton Town Council. £109—£130.—Mr. H. Hankinson, town clerk.

WATERWORKS ENGINEER.—July 28th.—Corporation of Rotherham. £120—£140.—Mr. C. L. des Forges, town clerk.

ASSISTANT DRAINAGE ENGINEER.—July 30th.—Madras Corporation, India. £33 6s. 8d. per month.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

INSPECTOR AND SURVEYOR.—July 30th.—Handforth Urban District Council. £90 per annum.—Mr. Herbert Worsley, clerk.

BOROUGH ENGINEER AND SURVEYOR.—July 31st.—Corporation of Guildford. £350—£450 per annum.—Mr. A. D. Jenkins, town clerk.

COUNTY SURVEYOR.—July 31st.—Cornwall County Council. £600—£700.—Mr. Christopher L. Cowlard, clerk, Bodmin.

CLERK OF WORKS.—July 31st.—Corporation of Denbigh.—Mr. E. Parry, town clerk.

INSPECTOR OF NUISANCES.—August 1st.—Sedgefield Rural District Council. £110 per annum.—Mr. J. W. Lodge, clerk, Sedgefield, Ferryhill.

CHIEF ASSISTANT.—August 1st.—Corporation of Bootle. £100 per annum.—Mr. Jas. H. Rothwell, town clerk.

SURVEYING ASSISTANT.—August 1st.—Corporation of Swansea. £120 a year.—Mr. H. Lang Coath, town clerk, Guildhall.

SURVEYOR.—August 3rd.—Faringdon Rural District Council. £120 per annum.—Mr. A. G. Haines, clerk.

CITY SURVEYOR.—August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

BUILDING INSPECTOR.—August 5th.—Corporation of Hove. £3 per week.—Mr. H. H. Scott, borough surveyor.

ASSISTANT TO COUNTY SURVEYOR.—August 5th.—Essex County Council. £200—£250.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ARCHITECTURAL ASSISTANT.—August 5th.—Corporation of Hove. £3 3s. per week.—Mr. H. H. Scott, borough surveyor.

DISTRICT SURVEYOR.—August 8th.—Pewsey Rural District Council. £90 per annum.—Mr. Robert Dixon, clerk.

SURVEYOR AND COLLECTOR.—August 14th. Wragby and Market Commissioners of Sewers. £150 per annum and commission.—Mr. Frank C. Hett, clerk of sewers, 11 Bigby-street, Brigg, Lincs.

COUNTY SURVEYOR.—August 19th.—Longford County Council. £250.—The Secretary, County Council Office, Longford.

ASSISTANT ENGINEER.—Gold Coast Government Railway. £400 per annum.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEERING DRAUGHTSMAN.—Public Works Department, Government of Nigeria. £400—£600.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LONDON.—September 7th. Designs for two new schools, for the London County Council.—The Clerk, Spring-gardens, London, S.W.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

GILDERSTONE.—Plans for twenty houses at prices from £200 to £270, for the urban district council.—Mr. W. Wilby, surveyor, Council Offices.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HEMEL HEMPSTEAD.—July 27th.—For the erection of fourteen cottages, for the rural district council.—Mr. T. H. Lightbody, surveyor, 20 Marlowes, Hemel Hempstead.

MARCH.—July 27th.—For the erection of sixteen workmen's dwellings, for the urban district council.—Mr. W. Fovargue, architect, The Causeway, March.

ERITH.—July 27th.—For the erection of a school, for the urban district council.—The Surveyor.

NOTTINGHAM.—July 27th.—For erecting water-closets and wash-houses, for the corporation.—Mr. A. Dale, city architect, Guildhall.

BROMLEY (Kent).—July 27th—August 27th.—For the enlargement of a hospital, for the Joint Hospital Board.—Mr. J. Ladds, architect, 93 Pemberton-road, Harringay, N.

WOLVERHAMPTON.—July 27th.—For the erection of cottages and stables, for the corporation.—Mr. G. Green, borough engineer.

GLAMORGAN.—July 27th.—For building new schools and alterations to existing schools, for the county council.—County Hall, Cardiff.

DONCASTER.—July 27th.—For school extension, for the Education Committee.—Borough Surveyor.

ERITH.—July 27th.—For the erection of a school, for the urban district council.—The Surveyor, Council Offices, Erith.

LEYTON.—July 28th.—For the erection of offices, for the urban district council.—Mr. E. H. Essex, surveyor.

BRIDGWATER.—July 28th.—For the erection of four cottages, for the rural district council.—Mr. W. A. Collins, surveyor.

WEST SUSSEX.—July 28th.—For alterations and additions to a school, for the county council.—Mr. H. P. Roberts, architect, Thurloe House, High-street, Worthing.

BROMLEY (Kent).—July 28th.—For the erection of a shelter, for the corporation.—Borough Engineer.

SEATON DELAVAL.—July 28th.—For the erection of a public shelter and urinal, for the urban district council.—The Surveyor.

MANCHESTER.—July 28th.—For the erection of tramway offices and public conveniences, for the Tramways Committee.—Mr. J. M. McElroy, general manager, 55 Piccadilly, Manchester.

IPSWICH.—July 30th.—For the erection of two transformer substations, for the corporation.—Mr. J. R. Mead, borough engineer and surveyor.

GRIMSBY.—July 30th.—For the erection of a battery-room, workshop, and lightning-switch-room, for the corporation.—Mr. W. A. Vignoles, Electrical Works.

SEDBERGH.—July 30th.—For the erection of twelve cottages, for the rural district council.—Mr. J. Stalker, architect, Kendal.

SHEFFIELD.—July 30th.—For the erection of district baths and central laundry, for the corporation.

WEDNESBURY.—July 31st.—For the erection of an electricity building, for the corporation.—Mr. E. M. Scott, borough engineer and surveyor.

BRIGHTON.—July 31st.—For alterations and additions to a school, for the Education Committee.—Messrs. T. Simpson & Son, surveyors, 16 Ship-street, Brighton.

ESSEX.—July 31st.—For alterations and additions to schools, for the Education Committee.—Mr. F. H. Bright, clerk, 53 High-street, Maldon.

CRAMLINGTON.—July 31st—August 5th.—For the erection of stables and cart shed, for the urban district council.—Mr. W. J. Coulson, surveyor.

RAMSEY.—August 1st.—For the erection of twelve cottages, for the urban district council.—Mr. P. S. Bennett, surveyor.

BROMLEY.—August 1st.—For the erection of eight cottages, for the rural district council.—Messrs. Potter & Harvey, architects, 49 London-road, Sevenoaks.

WANTAGE.—August 3rd.—For the construction of six workmen's dwellings in three pairs, together with the construction of a sewer, house and surface-water drains, sinking a well, and erection of fencing, for the rural district council.—Mr. John W. Harris, engineer and surveyor.

STOCKPORT.—August 4th.—For the erection of shelters, bowling houses, and tennis pavilions, for the corporation.—Mr. J. Atkinson, borough surveyor.

WEYMOUTH.—August 4th.—For the erection of twenty-three cottages, for the corporation.—Mr. S. H. Jackson, architect, Bridge Chambers, St. Thomas-street, Weymouth.

HUDDERSFIELD.—August 4th.—For the erection of a public convenience, for the corporation. Town Clerk.

STANLEY.—August 4th.—For the erection of an underground convenience and storehouse, for the urban district council.—The Surveyor.

AYLESBURY.—August 5th.—For building a generating station, for the urban district council.—Messrs. Kincaid, Waller, Manville & Dawson, St. Stephen's House, Victoria Embankment, Westminster, S.W.

EAST GRINSTEAD.—August 5th.—For widening a culvert, for the rural district council.—Mr. C. Turton, surveyor.

GLASGOW.—August 10th.—For masons' and concrete work for the proposed approach to art galleries, for the corporation.—Office of Public Works, 64 Cochrane-street.

LITTLEHAMPTON.—August 12th.—For the erection of a public lavatory, for the rural district council.—Mr. H. Howard, surveyor, Town Offices.

HERTS.—August 20th.—For the erection and completion of a new special subjects centre at Stevenage, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

GRANTHAM.—For the erection of two cottages, for the corporation.—Borough Surveyor, Guildhall.

Iron and Steel.

TENDRING.—July 27th.—For the supply of 2,190 yds. of 3-in. cast-iron water main, for the rural district council.—Mr. S. Francis, engineer, Town Hall Buildings, Clacton.

MANSFIELD.—July 28th.—For 4 miles of gas mains, for the corporation.—Mr. W. J. Rendell-Baker, gas engineer and manager.

Roads.

WHITCHURCH.—July 27th.—For steam rolling, for the rural district council.—Mr. J. T. P. Clarke, clerk.

WINCHESTER.—July 27th.—For asphalt macadamising work, for the corporation.—Borough Engineer.

WIGAN.—July 27th.—For paving portions of Chapel-lane and Poolstock with granite setts, for the corporation.—Mr. A. T. Gooseman, borough engineer, King-street.

BRAINTREE.—July 27th.—For the supply of 700 tons of broken granite and the use of a steam roller, for the urban district council.—Mr. H. H. Nankivell, surveyor.

BECKENHAM.—July 27th.—For the supply and delivery to Bromley South Railway Station (L.C. and D.R.) of 100 tons of [illegible] for the urban district council.—Mr. John A. Angell, surveyor.

LUTON.—July 27th.—For the supply of broken granite and slag, for the rural district council.—Mr. H. Pickering, surveyor.

WATFORD.—July 28th.—For making up certain roads, for the urban district council.—Mr. D. Waterhouse, engineer.

WOODFORD.—July 28th.—For the supply of broken granite and hire of steam rollers and scarifiers, for the urban district council.—Mr. W. Farrington, surveyor.

BIRMINGHAM.—July 28th.—For paving in High-street, Harborne (creosoted deal), Ryland-street, Ledsam-street, and Booth-street (granite setts and creosoted deal), and concrete foundations for Durax paving in Harborne-road, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

LARNE.—July 28th.—For the repair of sea pavements, fences, and making pipes, for the rural district council.—Mr. T. Nelson, clerk.

NORMANTON.—July 28th.—For paving work in High-street, for the urban district council.—The Surveyor.

SOYLAND.—July 28th.—For paving Yorkshire setts, for the urban district council.—The Surveyor.

EDMONTON.—July 28th.—For providing and laying creosoted deal blocks, for the urban district council.—Mr. C. Brown, engineer.

COLCHESTER.—July 29th.—For laying about 10,000 sq. yds. of wood-block paving, partly on cement concrete foundations, including the removal of existing granite sett paving and macadam, for the corporation.—Mr. Harold Collins, borough engineer and surveyor.

LLANTRISANT.—July 29th.—For making up certain streets, for the rural district council.—Mr. T. Saunders, surveyor, School-street, Pontyclun, Glam.

PERTHSHIRE.—July 31st.—For the reconstruction of 25 miles of road through Glen Dochart, Glen Falloch and Strath Fillan, in the parish of Killin, for the Western District Committee.—Mr. W. L. Gibson, engineer and surveyor, Post Office Buildings, Dunblane, Perthshire.

BLACKROCK (Co. Dublin).—August 1st.—For the excavation and grading of Temple-road, and for the supply and laying down of 4,500 sq. yds. of 8-in. concrete bed, and the supply of all materials, tools, and watching; also for laying down 4,500 sq. yds. of asphalt road surface on 8-in. concrete bed, and the supply of materials, tools, and watching, for the urban district council.—Mr. John Mooney, town clerk.

HASTINGS.—August 3rd.—For the supply of 2,000 tons of broken granite, for the corporation.—Mr. P. H. Palmer, borough engineer.

BARKISLAND.—August 3rd.—For laying tar macadam and setting, for the urban district council.—Mr. T. Hutton, surveyor.

CHINGFORD.—August 4th.—For making up parts of certain streets, for the urban district council.—Mr. T. J. Griffin, surveyor.

HOVE.—August 5th.—For providing and laying wood paving, for the corporation.—Borough Surveyor.

HUYTON-WITH-ROBY.—August 5th.—For paving with granite setts a part of Liverpool-road, for the urban district council.—The Surveyor.

BUXTON.—August 7th.—For various street works, for the urban district council.—Mr. F. Langley, engineer and surveyor.

HALIFAX.—August 8th.—For constructing about 1,310 super. yds. of Durax, Kleinpflaster, or similar granite paving, for the corporation.—Mr. J. Lord, borough engineer.

ALFRETON.—August 10th.—Offers for a steam roller built by Messrs. Aveling & Porter in 1893.—Mr. R. F. Ward, surveyor.

[illegible] surveyor.

BURNLEY.—August 14th.—For the supply of [illegible] tons of 12-in. and 5 tons of 1-in. best broken granite, [illegible] Mr. P. [illegible] Sprake, clerk.

ALEXANDRIA.—September 1st.—For the supply of [illegible] Ports and Lighthouses Administration of Alexandria. [illegible] Trade, 75 Basinghall-street, E.C.

Sanitary.

HARROGATE.—[illegible] 25th.—[illegible] of surface-water drain, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

HAMBLEDON.—July 27th.—For the collection and removal of refuse, for the rural district council.—E. G. Randall, clerk of the parish council, Shalford, Guildford.

NEWBURN.—July 28th.—For the construction of about fifty privies and ashpits into water-closets, for the urban district council.—Mr. T. Gregory, surveyor.

SOUTHGATE.—July 28th.—For laying surface-water sewers, for the urban district council.—Mr. C. G. Lawson, surveyor.

MARLBOROUGH.—July 29th.—For laying 276 yds. of 6-in. cast-iron pipe sewer in the college grounds, for the corporation.—Mr. G. Parker Pearson, borough surveyor.

CANNOCK.—July 29th.—For the supply, delivery, and placing in filters of about 3,400 cub. yds. of cold-blast furnace slag, and 1,845 cub. yds. of granite filling, washed and screened to the required size at the sewage farm, for the urban district council.—Mr. Robert Blanchard, engineer and surveyor, Council Offices.

AXMINSTER.—July 29th.—For the construction of sewage disposal works, for the rural district council.—Messrs. Phillott & George, engineers, 31 Promenade, Cheltenham.

NANTWICH.—July 30th.—For the construction of earthenware pipe sewer and manholes, for the rural district council.—Mr. C. E. Davenport, 152 Hospital-street, Nantwich.

HENDON.—July 30th.—For the construction of surface-water sewer, soil sewer, and concrete invert, for the rural district council.—Mr. J. A. Webb, surveyor, Stanmore Hill, Stanmore.

HAMILTON.—[illegible] August 31st.—For the [illegible] 12-in. and 15-in. sewer and brick concrete culvert, for the Middle Ward District Committee.—Mr. W. L. Douglass, district engineer, District Offices, Hamilton, Scotland.

CHIPPING NORTON.—July 31st.—For the provision and laying of about 3,600 yds. of earthenware pipe sewers, manholes, and ventilating columns, also extension to existing outfall works, construction of percolating filters, separating tanks, humus tanks, and other appurtenant works, for the corporation.—Messrs. Berrington, Son & Watney, Prudential Chambers, Lichfield-street, Wolverhampton, and 28 Victoria-street, Westminster, S.W.

ALNWICK.—[illegible] For laying 127 cub. yds. of 9-in. earthenware pipes, for the urban district council.—The Surveyor.

PORTHCAWL.—July 31st.—For the construction of certain lengths of stoneware and iron sewers of 9, 12, and 21 in. diameter, and concrete tube sewers of 30 in. in diameter, manholes, flushing tanks, and sea outfall, for the urban district council.—Messrs. J. Taylor & Sons, Caxton House, Westminster, S.W.

[illegible] For sewage disposal works extension, for the urban district council.—Mr. J. E. Aldersley, engineer and surveyor.

GRIMSBY.—August 1st.—For the construction of about 300 yds. of 9-in. sewer and manholes, for the rural district council.—Mr. A. Hobson, engineer and surveyor.

HARROW.—August 1st.—For works of sewerage, for the urban district council.—Mr. J. P. Bennetts, engineer and surveyor.

PORTSLADE.—August 4th.—For the construction of main surface-water sewer and outfall works, for the urban district council.—Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, S.W.

RUNCORN.—August 7th.—For the construction of sewers and sewage disposal works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

QUEENSTOWN.—August 7th.—For the construction of an outfall sewer, for the urban district council.—Mr. P. H. McCarthy, engineer, 39 Westmorland-street, Dublin.

RUNCORN.—August 7th.—For laying steel tube, cast-iron and earthenware pipe sewers, flushing tanks, storm overflows, manholes, ventilators, sedimentation tanks, percolating filter (including reinforced concrete construction on the Kahn system), engine and pump-house, pump well, and other appurtenant works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

SOUTHAMPTON.—August 12th.—For the construction of surface-water drains at Cosham, near Portsmouth, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

FLEET.—August 13th.—For the construction of about 16 miles of stoneware and cast-iron sewers, brick, concrete, and cast-iron manholes, flushing tanks, ventilating shafts and columns, cast-iron rising mains, air mains, engines, compressors, ejectors, and other works incidental thereto, for the urban district council.—Mr. T. J. Moss-Flower, engineer, 28 Victoria-street, Westminster, S.W.

DENTON.—August 15th.—For the construction of twelve new circular percolating filters, together with humus tanks, automatic dividing chambers and other works in connection therewith, for the urban district council.—Mr. J. B. Cooke, engineer and surveyor.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News*, New York.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BARROWFORD.—For the construction of sewage disposal works, for the urban district council.—Mr. F. Sutcliffe, surveyor.

CONTRACT No. 1.

C. Pashby & Sons, Headingley	£2,887
E. Armstrong & Son, Burnley and Brierfield	2,681
D. Flory & Son, Nelson	2,582
T. Dent & Sons, Nelson	2,531
Read Brothers, Burnley	2,488
J. & J. H. Boothman, Brierfield	2,398
G. Wilkinson, Barrowford*	2,389

CONTRACT No. 2.—Adams-Hydraulics, York, £960.

CONTRACT No. 3.—C. L. Scott, Birmingham, filtering medium.

BASFORD.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. S. Marlan, engineer and surveyor:

A. Sykes, Bridgford	£740
J. Thraves, Stapleford	739
A. & C. Barber, Bridgford	689
Brown, Stanton-by-Dale	686
Williams & Co., Kidderminster	684
A. Earnshaw, Ilkeston	657

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* By Reginald Ryves, ASSOC.M.INST.C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

BROMLEY, Kent.—For paving the carriageway in the main London road, a portion of High-street, East-street and Market-square with creosoted wood blocks, including the necessary excavation and concrete foundation, approximately 21,100 yds. super., for the corporation.—Mr. Stanley Hawkings, borough surveyor:—

	Per yd super s. d.
W. Griffiths & Co., Limited, Bishopsgate, E.C. ..	13 10
J. Mowlem & Co., Limited, Westminster, S.W. ..	13 7
Acme Flooring and Paving Company (1904), Limited, Victoria Park, E.	13 6
Improved Wood Pavement Company, Limited, London, E.C.	13 3
Fry Brothers, Limited, Greenwich, S.E. ..	12 11

CARLISLE.—Accepted for the extension of electric lighting station, for the corporation.—Mr. H. C. Marks, city engineer and surveyor:—

J. Long & Son, Carlisle, £4,125.

CONWAY.—Accepted for road construction, for the corporation.—Mr. A. Delamotte, borough engineer:—

R. Rowland Colwyn Bay, £470.

ENDON.—For the sewerage and sewage disposal scheme.

CONTRACT No. 1.

Whittaker Ellis, Birmingham	£8,840
F. Barke & Son, Stoke-on-Trent	8,340
G. Law, Leicestershire	7,757
Sanders & Torrance, Stoke-on-Trent	7,501
Grimes, Burslem	7,100
S. Salt, Leek	7,050
Childs & Withers, Worcester	7,008
Firth & Co., Derby	6,911
W. Snape & Sons, Eccles	6,851
J. & J. Warner, Mickleover, near Derby	6,700

HAMPTON.—For the extension of the isolation hospital, for the urban district council.—Mr. S. H. Chambers, surveyor:—

L. Lown & Co., Holloway, N.	£135
F. D. Hidden & Co., Limited, Brentford	131
W. Shepherd, Hampton	119
Ide & Sons, Kingston	115
E. Patterton, East Molesey	115
J. Wright & Sons, Hampton	98

HINDLEY.—Accepted for the erection of a school, for the urban district council.—Mr. Oswald P. Abbott, surveyor:—

Massey Brothers, Wigan, £6,050.

HONLEY.—For the erection of new council offices, for the urban district council.—Messrs. J. Berry & Sons, architects, Huddersfield:—

Excavator, Mason, and Bricklayer.—A. Frith, Shepley.
Carpenter and Joiner.—J. E. Marsden, Huddersfield.
Plumber and Glazier.—C. E. France, Honley.
Plasterer.—J. Wilkinson & Son, Meltham.
Concreter.—E. S. Jessop, Netherton.
Painter.—Spence & Co., Honley.
Slater.—Not settled.

HUNSLET.—For the extension and alteration of sewage works, for the rural district council.—Messrs. C. H. Marriott, Son & Shaw, engineers, Dewsbury:—

G. L. Briggs & Son, Halton, Leeds, £2,705.

INVERURIE.—Accepted for the construction of concrete pavement and granite kerb, for the corporation.—Mr. J. Milne, burgh surveyor:—

G. Robertson, Inverurie, £162.

SEAFORD.—For the supply of 1,000 tons of granite, for the urban district council.—Mr. B. A. Miller, surveyor:—

	1½-in. granite s. d.	Granite chippings Per ton. s. d.
Hudsons, Limited, Brighton	11 8	8 5
Croft Granite Company, Leicester ..	12 0	8 5
— Penlee, Bristol	11 10	8 7
Rowe & Mitchell, London	13 0	12 4
— Brooks, London	13 1	12 7
— Mannelle, London	13 2	12 8
Mowlem & Co., London	14 0	13 4
Emgeby Granite Company, Leicester	15 8	14 2
St. Keverne, Cornwall	12 0	--
Tilbury Contracting Company, London	12 10	--

SEAHAM HARBOUR.—For the erection of forty-five houses, for the urban district council.—Mr. W. R. Robinson, assistant surveyor:—

J. Huntley, Sunderland	£11,758
H. E. Pace, Sunderland	11,658
E. R. Davison, Blaydon	11,116
P. Duffy, Stanley S.O.	10,761
J. W. White, Sunderland	10,629
W. B. Cooper, Sunderland	10,509
Clark & Son, New Seaham	10,491
T. Curry, Seaham Harbour	10,330
H. Kirton, Seaham Harbour	10,270
T. Pearson, Spennymoor	10,236
J. Douglass, Newcastle-on-Tyne	9,957

WINCANTON.—For the construction of a reservoir, for the rural district council.—Mr. E. A. Rankin, engineer, Dorset:—

Franks, Harris Brothers, Limited, Sunningdale ..	£5,261
Johnson Brothers, Gloucester	4,895
E. G. Padfield, Evercreech	4,891
J. A. Ewart, junr., Taunton	4,456
R. Bricknell, Yeovil	4,341
Smith & Marchant, Shepton Mallet	4,299
G. Pollard & Co., Taunton	4,160
R. W. Martin, Castle Cary	4,051
T. J. Davies & Co., Penarth	4,047
Staveley Coal and Iron Company, Limited, Chesterfield	3,940
W. Watson, Halfwhistle	3,932
W. Sparrow, Limited, Martock	3,925
T. B. Gulliver, Parkstone	3,809
Wright & Son, Glastonbury	3,801

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JULY

25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

AUGUST

15-17.—Institution of Municipal Engineers: Visit to Hunstanton.

SEPTEMBER.

19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.

26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

TENDERS WANTED.

HERTFORDSHIRE COUNTY COUNCIL.

STEVENAGE COUNTY COUNCIL SCHOOL.

NEW SPECIAL SUBJECTS CENTRE.

The Education Committee are prepared to receive Tenders for the Erection and Completion of a New Special Subjects Centre at Stevenage.

Persons desiring to Tender for the work may see the Drawings, Specification, Agreement, &c., at the County Surveyor's Office, Hatfield, on or after Thursday, 16th July, 1914, between the hours of Ten a.m. and Four p.m., except on Saturdays, when they may be seen from Ten a.m. till Twelve noon.

A copy of the Schedule of Works (Quantities) and a Form of Tender can be obtained at the County Surveyor's Office upon payment of Two Guineas, which sum will be returned to the tenderer upon receipt of a *bonâ-fide* Tender and the documents which have been supplied to him.

Sealed Tenders, endorsed "Tender for New Special Subjects Centre, Stevenage," must be delivered to the undersigned, at his offices, not later than Four p.m. on Thursday, 20th August, 1914.

Such security for the due execution of the works as the Council may require must be given by the Contractor.

The lowest or any Tender will not necessarily be accepted.

URBAN A. SMITH,
County Surveyor.

County Surveyor's Office,
Hatfield.
July 14, 1914. (1,800)

(Continued on p. xxii.)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYING ASSISTANT (Swansea, August 1st).—The Corporation invite applications for the appointment of a Temporary Assistant in the Borough Surveyor's Department. Applicants must have been articled to a Borough Surveyor or Urban District Surveyor, and have had experience in municipal, engineering and surveying work. The appointment will be for 12 months, at a salary of £120 per year. Applications, stating age, experience, &c., together with copies of not more than three testimonials, which will not be returned, to be delivered to Mr. H. Lang Coath, Town Clerk, Guildhall, by noon on August 1st. (1,805)

PEWSEY RURAL DISTRICT COUNCIL.

DISTRICT SURVEYOR.

Applications are invited for the Appointment of District Surveyor.

Salary £90 per annum. The person appointed will be required to devote his whole time to the service of the Council. He will also be required to give a Bond for £200 in an approved Guarantee Office.

Applications, in Candidate's own handwriting, stating age and previous experience, together with copies of three testimonials of recent date, must reach me not later than the 8th August next.

ROBERT DIXON,
Clerk to the Council.

Pewsey.
July 15, 1914. (1,794)

BOROUGH OF BRIGHOUSE

BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT

CHIEF ASSISTANT

The Town Corporation invite applications for the appointment of Chief Assistant to the Borough Engineer and Surveyor at a commencing salary of £200 per annum.

Applicants whose age must not exceed 35 years must have had previous experience in a Municipal Engineer's Office, and be neat and expeditious draughtsmen, careful and accurate surveyors and levellers, with a good knowledge of Building By-laws and routine office work.

A knowledge of Architecture will be a recommendation.

Applications, in candidate's own handwriting, stating age, qualifications and experience, and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than Saturday, August 1st, 1914, and endorsed "Chief Assistant."

Canvassing, either directly or indirectly, will disqualify.

(By order)
JAS. H. ROTHWELL,
Town Clerk.

Town Clerk's Office,
Municipal Offices,
Brighouse.
July, 1914. (1,803)

ST. ANNES-ON-THE-SEA URBAN DISTRICT COUNCIL.

The Urban District Council of St. Annes-on-the-Sea invite applications for the appointment of Engineer and Surveyor to the Council. The person appointed must be a Member or an Associate-member of the Institute of Civil Engineers, and must be capable of carrying out all duties of an Engineer and Surveyor under the Public Health Acts and all other Acts incorporated therewith, and must devote the whole of his time to the duties of the office.

Commencing salary £200 per annum, and an Articled Pupil will be allowed.

Applications, stating qualifications, age and particulars of present appointment, to be supported by copies of not more than three testimonials, and the names of two referees, to be addressed to the undersigned, endorsed "Surveyor," not later than the 27th day of July instant.

Canvassing, either directly or indirectly, will be deemed a disqualification.

(By order of the Council)
T. BRADLEY,
Clerk.

Council Offices,
St. Annes-on-the-Sea.
July 10, 1914. (1,783)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE

ASSISTANT TO THE COUNTY SURVEYOR

Applications are invited for the appointment of a General Engineering Assistant on the Staff of the County Surveyor. Candidates must have had previous experience in the Office of a County Surveyor, and be specially qualified in the use of Ferro-concrete for Bridge and Culvert construction.

Salary £200 per annum, rising by annual instalments of £10 to a maximum of £250. Age not to exceed 40.

The appointment will be subject to three months' notice given or received. No superannuation or pension is attached to the appointment.

A medical examination will be a condition precedent to any appointment.

Applications, with not more than three recent testimonials (copies), both as to ability and good character, to be received at the office of the County Surveyor, Chelmsford, not later than Wednesday, August 5th.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
July 15, 1914. (1,797)

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OF

ROAD MAKING MATERIALS & APPLIANCES

AND

MUNICIPAL ENGINEERING REQUISITES.

Firms desiring to Exhibit should apply without delay to—

C. S. MASON,

24 BRIDE LANE, FLEET STREET, E.C.,

of whom all information can be obtained.

OLYMPIA from APRIL 13th to 25th, 1915.

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COUNTY OF CORNWALL.
APPOINTMENT OF COUNTY SURVEYOR.

The Cornwall County Council invite applications for the appointment of County Surveyor.

Applicants must be not less than [illegible] nor more than [illegible] years of age.

The Council attach importance to practical skill, experience in County Administration.

Salary [illegible] per annum, increasing by [illegible] to £700.

Office and staff will be provided, and all reasonable travelling expenses and other disbursements will be borne by the County Council.

The appointment will be during the pleasure of the Council, and be determinable by 3 months' notice on either side.

Applications [illegible] of particulars as to previous service, &c., to be inserted in a Form which can be obtained from the undersigned, and by [illegible] not more than three recent testimonials.

Canvassing, either directly or indirectly, will be considered a disqualification, and candidates must send printed copies of their applications and testimonials to the members of the Highways Committee, a list of whom can be obtained on application.

The person appointed will be required to devote the whole of his time to the duties of his office.

Applications must be sent in to the undersigned not later than the 31st instant.

Further particulars of the terms of the appointment can be obtained from the undersigned.

CHRISTOPHER L. COWLARD,
Clerk of the County Council.

Bodmin.
July 3, 1914. (1,765)

CONTRACTOR'S AGENTS required, with Civil Engineering experience. Salaries from £250 to £350. Apply, in writing, to the Secretary, Anglo-Mexican Petroleum Products Company, Limited, Finsbury-court, London, E.C. (1,809)

BOROUGH OF HOVE.

Required, temporarily, a fully qualified Architectural Assistant at a period [illegible] Salary [illegible] per week. Must be able to prepare Plans, Specifications and Quantities of Buildings. Previous [illegible] given to one who has experience of Municipal Buildings. Applications, stating age, previous experience, and accompanied by copies of not more than three recent testimonials, [illegible] Architectural Assistant, [illegible] Town Hall, Hove, not later than 5th August, 1914.

H. H. SCOTT,
Borough Surveyor.

July 21, 1914. (1,807)

BOROUGH OF HOVE.

Applications are invited for the appointment of Building Inspector. Salary, £3 per week. Applicants must have had previous experience in a Municipal Office, and have a good knowledge of Building Construction, Drainage and Building By-laws. Applications, stating age, previous experience, date at which duties can be commenced, and accompanied by copies of not more than three recent testimonials, are to be endorsed "Building Inspector," and must be received not later than the 5th August, 1914.

H. H. SCOTT,
Borough Surveyor.

July 21, 1914. (1,808)

EX-PUPILS AND JUNIOR ASSISTANTS.

ASSISTANT (20) desires appointment with good prospects: 4 years' experience of surveying, levelling, constructive and working drawings, roads, sewers, draughtsmanship, drainage and sanitation. Good credentials. Reading for P.A.S.I. and A.M.I.C.E.—Apply Box 1,449, office of THE SURVEYOR, 24 Bridge-lane, Fleet-street, E.C. (1,810)

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The Surveyor

And Municipal and County Engineer.

Vol. XLVI. JULY 31, 1914. No. 1,176.

Minutes of Proceedings.

School Buildings.

It is now some seven years since the Board of Education issued a code of regulations for the guidance of architects in designing school buildings, and so rapid and continuous has been the development in all matters relating to education since that time that it is not surprising that the board have recently decided to revise their requirements. From one point of view the matter is not one which practically concerns the municipal engineer or surveyor, inasmuch as the effect of sec. 3 of the Education (Administrative Provisions) Act, 1911, is generally to exempt from the operation of building by-laws "any new buildings being school premises to be erected, or erected according to plans which are under any regulations relating to the payment of grants required to be, and have been, approved by the Board of Education." On the other hand, however, many municipal surveyors also hold office as architects to local education authorities, and so have a very direct interest in the matter. We make no apology, therefore, for drawing the attention of our readers to the recently issued Building Regulations for Public Elementary Schools. The tendency of modern thought is well reflected in the character of the matters in regard to which the principal changes have been made. These relate to design as affected by ventilation, to disposition of buildings on the site, to size and organisation of departments, and to the extent and character of the facilities for physical exercises, play, and organised games, whether for older or younger children. The new regulations are stated in the prefatory note to be the outcome of discussions which have taken place during the last six years in numerous particular cases between the board's officers and the officers and architects of local education authorities and governing bodies. They thus have behind them the full force of a very considerable practical experience.

It is impossible here to deal at length with the several matters comprised in the regulations, including, as they do, full instructions in regard to all the principles to be observed in planning and fitting up new school buildings. The several chapters into which the regulations are divided treat at length of sites and playgrounds, the general arrangement of the building, accommodation, details of various parts of the building, the teacher's house, ventilation and heating, construction and materials, water supply, and plans and procedure. They are not intended as a code of precise and definite rules, but rather partly as a statement of the principles of school planning upon which the board proceed in criticising the plans submitted to them, and partly as a statement of what the board believe to be the best current practice in the application of those principles. The main object in drafting them has been to facilitate co-operation between central authorities, local authorities and architects in securing the greatest amount of comfort, convenience and suitability which a reasonable expenditure can be made to yield. In this, as in other branches of local administration, the question of finance is of the utmost importance. After all, educational efficiency does not depend entirely, or even mainly, upon expensive buildings. It is evident that improved buildings will be of little value if accompanied by a tendency to check improvements in the qualifications and numbers of the teachers employed, and to restrict expenditure in other necessary directions. The available funds are limited, and in administering them the object to be aimed at is the maximum possible all-round educational efficiency. In securing this result well planned and fitted buildings play no small part, and great responsibilities lie upon the Board of Education and school architects. On the one hand the board must try to secure schools which will yield the greatest possible educational advantage to the rising generation, and in considering educational advantages they do not ignore the effect of beauty of design, material or decoration, on the minds of the children or of their parents whose respect for and belief in education are essential to progress; on the other hand, the board have to take account of the present state of public opinion, whether expressed in Parliament or in the municipal assemblies to whom Parliament has committed responsibility for the local administration of education, and while endeavouring to influence public opinion in the direction which they believe to be beneficial to the nation, they cannot ignore the risk of provoking reaction. In this, as in other departments of administration, some degree of compromise is inevitable.

* * *

London's Electricity Supply.

It seems at least possible that, as an outcome of the report of Messrs. Merz and McLellan to the London County Council, upon which we recently commented, some progress may be made towards finding a solution to

the complicated problem of organising the supply of electrical energy to London. The Special Electricity Committee have presented to the council a report recommending the latter to promote a Bill in the next Session of Parliament with a view to establishing a new *regime*, and the matter was to be discussed on Tuesday this week. As had been anticipated, the committee recommend a middle course, combining the advantages of municipal finance and control with those of operation by a private company. A new authority representing the London County Council and other public bodies will hold the purse-strings, a small technical committee will supervise the operations of the company, and the company will carry on the business on commercial lines. The bulk of the capital will be provided by the public authority, which also will take the lion's share of the profits; existing undertakings will be acquired by agreement, if possible, without resorting to compulsory powers—the council has the right to purchase them in any event in 1931—and the company may be composed of representatives of the existing companies. If the latter, however, refuse to come to terms the council may call in an outside company. The undertaking will be of immense magnitude, covering an area of 964 square miles, with a population of 7,500,000, and the matter is pressing for attention; for not only is the present system, or rather lack of system, wasteful and expensive, but the companies cannot raise capital for extensions while the situation is unsettled, and financial groups are meditating action with a view to gaining possession of the field if the county council does not occupy it first. It is not proposed, nor would it be necessary, to revolutionise the existing arrangements and co-ordinate the various systems at one stroke; on the contrary, the methods of supply would be unified by degrees with the minimum waste of capital. The extension of existing generating stations in unfavourable situations would be avoided by erecting new stations down the river, from which a bulk supply on the most economical basis would be given to the existing undertakings, and the conversion of the distributing systems to one uniform pressure, current and frequency would be a matter of years. The type of organisation proposed is by no means new, though it has not been adopted previously in this country. All things considered, we think that the scheme put forward by the committee is worthy of serious consideration, and that, although modifications of detail may be desirable, the principle may be accepted as offering good prospects of a satisfactory solution to the problem. The sooner active steps are taken to reform the conditions now obtaining the better, for the greatest city in the world is handicapped by excessive prices for electricity, and a perfectly bewildering medley of systems of supply.

The Removal of Iron from Water.

The removal of iron from water by means of aëration is no new idea, but difficulties are often encountered in the subsequent filtration or settlement required in order to remove the oxide of iron from the water. The successful removal of iron from well water supplied by the Champaign and Urbana Water Company, which was described recently in the *Engineering Record* of New York, provides an interesting example which may be useful under similar conditions. The water contains 2 parts per 1,000,000 of iron, 40 parts of carbonic acid gas, and no dissolved oxygen, and is pumped from a fine sand stratum. Long-standing trouble from crenothrin and stained porcelain led to experiments which proved that the iron could be removed by means of aëration and sand filtration without the use of chemicals. The water is aërated as it falls from the pumping main into a basin. From this basin the water is again pumped into the filters, rising as a jet and falling vertically. It is thus aërated. The filters are ordinary sand filters arranged on the principle of the mechanical filter with air and strainer systems for washing. The filters consist of 30-in. depth of sand and 8 in. of gravel. Each filter, being 12 ft. by 15 ft. in plan, deals with 500,000 gallons a day. After about six weeks of service, the sand grains became so badly coated that the ordinary washing arrangements were found to be inadequate. This difficulty has, however, been overcome by pumping the sand through a centrifugal pump, which cleans it satisfactorily.

It is expected that the process will be perfected to such a degree that the sand of a filter may be washed by running it through a centrifugal pump, and then returning it to its place directly, without using much more water than is required for the ordinary daily wash of the filter. The sand of the beds has been washed in this manner twice in eight months. The occasional use of a fire hose in stirring and washing the sand in the beds has also been found to be effective, the amount of water used being about the same as that required for the ordinary daily wash. Experimental work carried out in order to ascertain whether the application of chemicals to the water would lessen the difficulties of washing has shown no advantage to accrue from this. It is, perhaps, remarkable that for such a purpose as this the fixed spray or rotary sprinkler, similar to those used for sewage filters, is not applied more frequently. It is certain that the aëration would be more perfect; the method would, however, be more applicable to slow sand filter beds than to the rapid mechanical filters. The method of washing the sand at the Urbana works by passing it through a centrifugal pump is certainly interesting, and may have valuable applications.

* * *

Public Health of Marylebone.

We have received a copy of the annual report of Dr. Charles Porter, the medical officer of health of St. Marylebone, on the public health and sanitary condition of the borough. In the main this is a satisfactory document. In the first place the rate of infantile mortality, which has been steadily on the decline for some years past, reached in 1913 the lowest point on record. Again, in regard to the duties thrown upon the public health department by Part I. of the Housing, Town Planning, &c., Act, 1909, considerable activity has been shown. The house-to-house inspection enjoined by the Act has been proceeded with, and in those cases where it seemed necessary to do something more than could be called for by the usual nuisance notices the practice has been followed of communicating with the owners before making any report to the Public Health Committee. This procedure has resulted in the execution of much necessary work with a minimum of friction. The list of premises dealt with under the Act is a formidable one, and affords convincing proof of the benefits which the borough is receiving from the powers conferred by it. It is particularly interesting to observe the statement that owners always show themselves to be willing to meet the medical officer of health or the inspector and discuss matters, and that improvements of real value are undoubtedly obtained because the necessity for them and the methods by which they could be brought about are discussed in a friendly way. Another important matter in regard to which the public health department has guarded the public interest is that of nuisances from the emission of black smoke. The

total number of observations of chimneys made by the inspectors was 1,191, and seven nuisances were discovered. A report was submitted to the Public Health Committee at each meeting with regard to the number of observations made and nuisances discovered. In each case in which a nuisance had been detected the owner was communicated with, and any explanation he had to offer was considered by the committee along with the reports of the inspector. In five of the cases the nuisance ceased after the service of intimation notices. In two statutory notices were served; but in no case was it found necessary to issue a summons. The report, of course, deals with many other matters, but enough has been said to show that Dr. Porter and his staff have carried out another year's excellent work for the borough.

* * *

Tramways and Town Planning.

The mutual dependence of town planning and cheap, quick means of transport from central to outlying areas is now generally recognised, and it was therefore thoroughly appropriate that Mr. J. A. Brodie, M.INST.C.E., the city engineer of Liverpool, should have taken "Town Planning in Relation to Tramways" as the subject of the paper which he read at the annual congress of the Tramways and Light Railways Association held recently at Newcastle-on-Tyne. Speaking, in the first place, of the absurdly inadequate powers of local authorities in regard to arterial roads prior to 1909, Mr. Brodie well said that, if the intention of Parliament had been that it should be made as difficult and expensive as possible for public authorities to arrange for satisfactory main lines of communication within and outside a town, then these old powers were certainly well arranged for the purpose. Want of foresight in regard to this matter in the past is proving an exceedingly costly matter in most large towns at the present time. Experience has shown that, in the case of street improvements in central areas, about four-fifths of the whole expenditure goes in payment for houses and compensation, all of which would have been avoided if care had been taken to see that ample width for traffic purposes had been originally provided. Details which Mr. Brodie gave of the construction of a road 120 ft. in width on the outskirts of Liverpool were of special interest. Economies—particularly in regard to the method of laying the tramway track—enabled a street of this width to be constructed at the same cost as would have been necessary to provide for a street only 80 ft. wide, with tramways of the usual construction and paved complete. Dealing with the future of tramways, Mr. Brodie expressed the view that the main factor leading to success will be speed. But combined with speed there must be safety both for passengers and for the other users of the road, comfort for passengers and to the occupiers of frontage property, and reasonable economy. In the latter parts of his paper Mr. Brodie discussed the means to be adopted for securing these desirable ends. His observations in regard to the possibility of using some form of indiarubber tyre are specially noteworthy, but the whole paper—some extracts from which we propose to give next week—will well repay careful perusal.

* * *

The Paignton Surveyor and Motorists.

Certain "Motor Notes," the nature of which one may make a shrewd guess at, are responsible for a decidedly spirited report which the surveyor to the Paignton Urban District Council, Mr. C. O. Baines, made recently with respect to the condition of and traffic on the Totnes road, about 3½ miles of which are in the jurisdiction of the council. In order, presumably, that there should be no question of his doing things by halves, Mr. Baines told the council that he had traversed the whole stretch of road by motor car, motor bus, motor cycle and push bicycle. The surface "he found to be good enough for the maddest motorists." It was quite possible, he added, to travel at an average speed of 17 to 19 miles per hour. Whether this would be quite enough or even approximately enjoyable to the "maddest motorists" is, of course, open to question, but it was sufficient, at all events, for certain definite achievements, for the council were informed by Mr. Baines that "the ponderous motor omnibuses were able to cover the 3 miles from Collaton Village to the Toll-house at True-street in eleven minutes, including two stops for passengers and an additional stop for a vigorous exchange of compliments between the chauffeur and driver of a slow mineral-water wagon." Particularity being obviously an object that Mr. Baines had specially in view in dealing with this matter, he proceeded to state that he had made four journeys along the road, and the times were practically the same. "The people who appeared to ignore the statements regarding the road most," he observed, reflectively, "were the motor cyclists themselves, judging by the speed at which they travelled and the way they talked about their performances afterwards." In the latter sentence Mr. Baines has exposed with discernment something of the true inwardness of the motor cyclist, who is generally nothing if not a pace-at-any-price man. In the circumstances it is, perhaps, well that he and his complaints should not be always taken too seriously, but rather that he should be considered with indulgence—according to the not ungracious measure of Mr. Baines.

* * *

Electrolytic Disinfectant.

The report of Dr. Fredk. W. Alexander, medical officer of health for Poplar, contains an interesting reference to the electrolytic disinfecting fluid with which the name of that official has been associated for several years past. The fluid, we read, is still in great demand by the public. The baths superintendents repeat their statements that the addition of the fluid prevents the formation of slime in the water, and that there is no offensive smell when the baths are being cleansed. It should be explained that the electrolytic fluid in the Poplar baths is not used with the idea of rendering unnecessary periodic changes of the pond water, but to keep the water in the pond fresh and free from harmful organisms all the time it is in use. The class of persons who use the swimming ponds in Poplar is always likely to contain uncleanly or infected individuals, and it is to guard against danger from the latter that the fluid finds its chief application. At Poplar the electrolytic fluid costs in its preparation about £2 per 1,000 gallons, or a little less than ½d. per gallon. Thirty gallons are added to a swimming pond of 85,000 gallons capacity on first filling, and subsequent additions are made as required, at intervals of two or three days. A tribute to the efficacy of the process is the fact that, in addition to plants already supplied to the British War Office and Admiralty, others have quite recently been sent to Finland, Buenos Ayres, and Rangoon. The Gateshead Corporation have also given an order for a plant to be erected, and a large one is being installed for the Portsmouth Corporation. It is interesting to note that in the last case the fluid to be electrolysed is sea-water itself, which, of course, is close at hand, and a ready and powerful disinfectant is manufactured by this process without cost of materials but merely that of electric current.

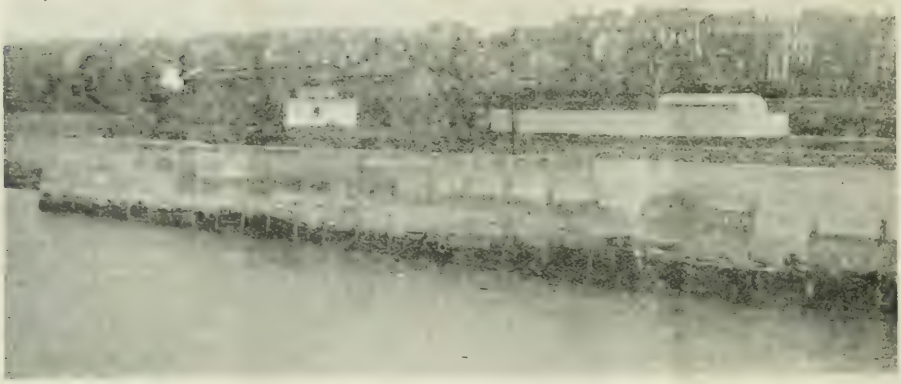
Carnarvon Sea Wall.

By H. C. Ritchie, Assoc.M.Inst.C.E.

A sea wall recently at Carnarvon Docks has actually provided an example of a method in which the many difficulties encountered in carrying out local or underwater work may be obviated by the adoption of reinforced concrete as the material for construction.

The Port of Carnarvon, which until recently had been engaged chiefly in the slate export trade, has now become in addition to this an important local centre for the storage and distribution of petroleum and motor spirit. The rapid development of the import trade consequent upon the ever increasing demand for oil fuel led the Harbour Trust to consider the advisability of providing additional accommodation to cope with the traffic, which resulted in the adoption of a scheme prepared by their engineer, Mr. William Bowen-Jones, Assoc.M.Inst.C.E., which embraced a 300-ft. extension to the existing masonry sea wall, to afford increased wharfage for oil tank steamers, and the reclamation of about two acres of foreshore. The existing heavy masonry structure, 20 ft. high from shore to coping, rested on a foundation 6 ft. below [illegible] level, and it was originally intended to construct the extension in a similar manner.

As the line of the present structure follows approximately low water mark at ordinary tides, it will be readily appreciated that, in order to execute the new work satisfactorily in masonry, it would have been necessary to provide a half-tide dam. The expense of this temporary work, combined with the heavy cost of pumping involved in the construction of the lower portion of the wall, led to the abandonment of the masonry design in favour of a Kahn system reinforced concrete structure.



Front View—Carnarvon Sea Wall

The requirements of the reinforced concrete design were to provide a wall which in the first place could be constructed with a minimum of interference from the tide, and in the second place which would withstand the full earth load at the back of the wall with the front face unloaded during low tide, and in the third place which would withstand shocks due to wave action without support from the earth filling at the back of the wall, as the intention of the Harbour Trust was to fill in behind the wall with dredg-

Rear View—Carnarvon Sea Wall

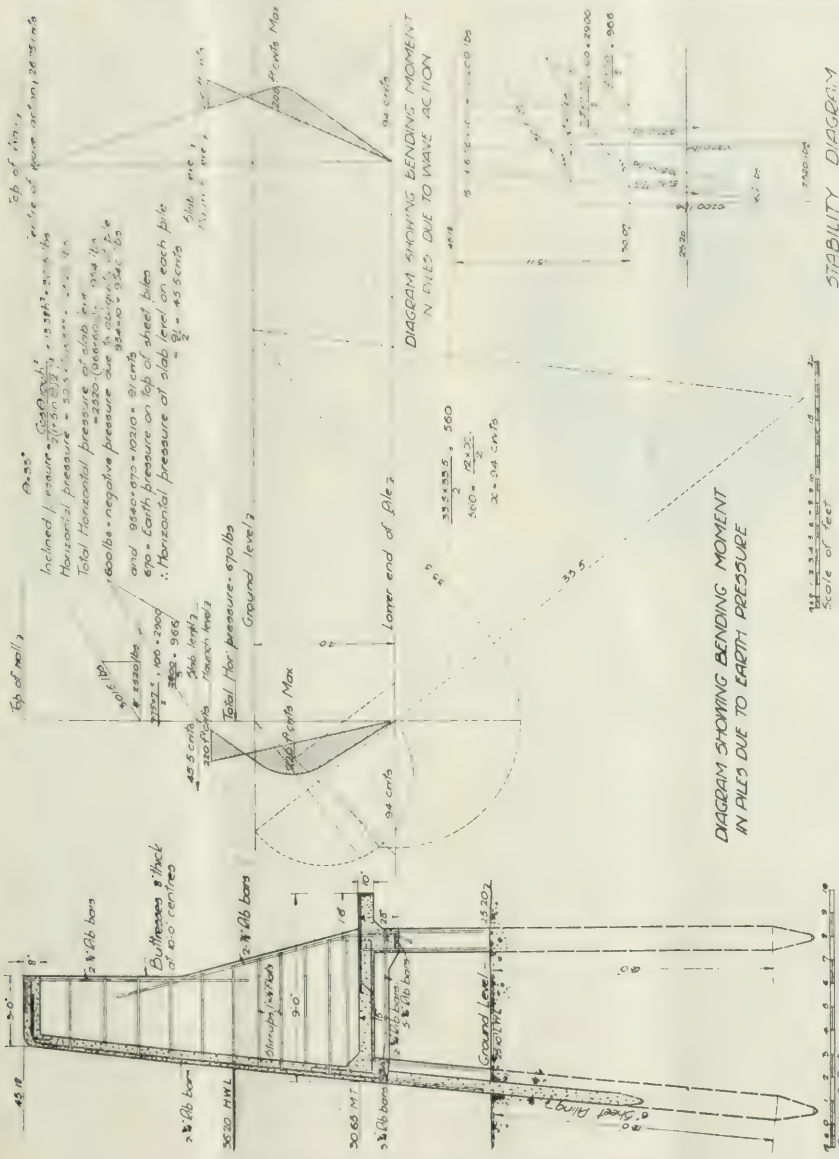
tion, a process which would in all probability occupy a long period. The general character of the design is shown by the cross section of the wall.

It will be noticed that, broadly speaking, the construction consists of an ordinary type of reinforced concrete retaining wall carried on legs of reinforced concrete piles. That portion of the structure which is above mean sea level, and which could therefore be worked upon for five or six consecutive hours at each tide, is of the design usually adopted for retaining walls. The face slab of the structure has a batter of 1:10, and is supported by upright cantilevers spaced at 10-ft. centres, which in turn react upon the base of the wall in the usual manner. This base of the upper portion of the wall is carried upon reinforced concrete piles, two under each cantilever or buttress. One of these is lineable with the face of the wall, and the other is driven vertically, and is situated 18 in. from the back edge of the base slab. The lower portion of the face of the wall from the foundation up to the underside of the base of the superstructure is formed of reinforced concrete sheet piling, which enabled the work which was below high-tide level to be cast in independent units, and driven into position, thereby overcoming the difficulties of tidal interference.

In the design of the work the tensile, compressive and shearing stresses recommended for steel and concrete in the second report, 1912, of the R.I.B.A. Joint Committee were adopted.

The face slab is 6 in. thick and is reinforced near both the outer and the inner surfaces by a continuous beam, to resist the stresses due to the earth filling at the back of the wall at low tide, and also to resist the effect of impact of a 6-ft. wave striking the face of the wall at any level from shore to coping, and prior to the completion of the earth filling at the back of the wall. Inasmuch as the mean sea level at the front and back of the wall is the same at all stages of the tide, allowance was made for the support afforded by still water acting against the inner face.

The cantilevers or buttresses which support the face



DESIGN OF CARNARVON SEA WALL.

[illegible] 10 in. by 8 in. at the base, tapering to 36 in. by 8 in. at the top, being designed of that depth under the loading to carry a dock rail 3 ft. wide, making the full length of the wall.

The [illegible] at the back of these members, resisting the maximum bending moment due to earth pressure, consists of a group of Kahn rib bars having a total cross-sectional area of 2·06 sq. ins., and the reinforcement at the face, to resist the effect of impact of a wave striking the top of the wall, consists of Kahn rib bars, having 1·12 sq. ins. cross-sectional area. The ends of these two groups of bars are anchored around the bottom reinforcement of the two longitudinal beams carrying the base slab. This slab is 10 in. thick, and extends as a cantilever 18 in. beyond the centre line of the back longitudinal beam. It is reinforced with ¾-in. Kahn trussed bars at 13-in. centres on the 7-ft. span between the beams, and with ¾-in. Kahn rib bars at 19½-in. centres over the back support.

The two parallel longitudinal base beams are reinforced with Kahn bars as continuous beams to transmit the anchorage afforded by earth pressure on the base slab to the cantilevers described above.

The illustration on page 153 shows a stress diagram determining the value, position, and direction of the two alternative resultant thrusts, acting at the base of the superstructure, under the two main conditions of loading already referred to, as well as their resolution into vertical and horizontal forces distributed between the two king piles supporting each buttress. This same illustration shows the determination of the bending moments in the piles due to the wave action and to the earth filling. The designing of this portion of the work was necessarily complicated, owing to the fact that the piles are treated as vertical continuous beams, and deflect into peculiar shapes under the loading and wave impact.

The sheet piles were 18 in. by 6 in. cross section with semi-circular grooves running down the sides of the piles, and with a specially designed shoe having a projecting bead to fit into the grooves of the adjoining piles.

It was estimated that a rock foundation would be found at an average depth of 12 ft. below shore level, and therefore the king piles were designed 18 ft. long. The sheet piles were constructed 12 ft. long to allow for a 15 in. connection and a 6 ft. 6 in. drive.

The contract for the execution of the work was signed on the 8th May, 1913, and the work on the site was commenced on the 8th June. The first operation consisted of the casting of the piles. Both the king and sheet piles were cast as near as possible in the order they would be required, and driving was commenced nine weeks after the moulding of the first batch. One pile-driver was sufficient to enable the contractor to complete the work within six months, the specified time. The pile-driver was carried on an elevated track running parallel to the main line of the piles, the rails of which were approximately at mean tide level.

The work was commenced at that end of the wall which abuts against the masonry structure, and, as anticipated, the hardest driving was there experienced. The first few king piles, nine weeks old, were punished rather severely before they attained the necessary set, and driving was temporarily suspended for a further three weeks. The damaged heads of the piles were cut off, and when driving was resumed everything progressed satisfactorily, owing to the fact that the concrete had then sufficiently matured. The average rate of driving was eight piles per day, and work was commenced on the superstructure when about one-third of the foundation had been completed.

The concrete throughout the whole of the work consisted of Penmaenmawr granite chippings passing through a ¾-in. screen, Anglesey sand, and British Portland cement mixed in the proportions of 3:1½:1; and the reinforcing steel consisted of Kahn trussed and rib bars.

Illustrations are given of the front and back views of the completed structure before the filling operation at the back of the wall had been commenced.

The cost of the reinforced concrete structure was about £2,000. Tenders had originally been received for the construction of this 300-ft. length of wall in masonry, and the lowest offer in this case from contractors was £4,600. This illustrates the marked economy effected by the elimination of the difficulties of under-water construction by the use of reinforced concrete work.

Mr. W. H. Brocklesby, of Birkenhead, was the contractor for the work, which was carried out under the supervision of a clerk of works instructed by Mr. Wm. Bowen-Jones, A.M.I.C.E., engineer to the Carnarvon Harbour Trust, and by the writer of this article acting on behalf of the Trussed Concrete Steel Co. Ltd., who were responsible for the preparation of the detailed designs of the reinforced concrete work.*

BIRMINGHAM ROADS.

CITY ENGINEER'S REPORT.

The report of Mr. H. E. Stilgoe, M.INST.C.E., the city engineer and surveyor, on the work of the Birmingham public works department during the year ended March 31st last, has been issued.

Mr. Stilgoe remarks that the total expenditure on capital and revenue accounts in respect of highways, sewers and rivers, and public lighting, including the cost of administration of the various departments, of a sum equal to a rate of only 2s. 0·65d. in the £ is very low. The advance in the standard of efficiency in matters relating to public health and in the upkeep of the highways, combined with the ever-increasing demands of traffic, render it imperative that the streets shall be better constructed and maintained in a good condition of repair and cleanliness. The officials study every economy and care in administration, but the money provided for the purposes of the highways is insufficient to meet the demands. Many miles of roads have never been properly constructed, and an inspection of the trenches cut for sewers, mains, and other purposes reveals the fact that the majority of the old roads have no foundations at all. The surfaces have carried the light traffic of their day, but they will not withstand the modern traffic. In February last he reported upon the havoc wrought by the motor omnibus traffic, and presented a return of the cost of repairing the damage done, amounting to thousands of pounds. The streets are being gradually improved by reconstruction. In many of the streets where there is heavy traffic the houses are built right up to the back of the footpaths, and when the doors and windows are open the dust from the macadam very readily blows into the houses.

Mr. Stilgoe suggests that a great benefit would be conferred if these could be paved, a few each year. They could be kept clean more easily, and the health of the residents would thereby be improved. An expenditure for a few years of £10,000 a year on permanent work of this character would not be a great burden, considering that last year the produce of a penny rate on the improvement rate account was equal to £14,959.

COSTS.

The lengths of the declared highways were 599 miles on March 31st last, compared with 594 in 1913. The areas laid with granite sett paving were 20,864 super. yds. in 1913-14, 18,361 in 1912-13, and 18,045 in 1911-12. The expenditure on the maintenance of roads was as follows: Repairing macadamised roads, £54,884, cost per mile £104; repairing granite pavements £1,153, cost per mile £25; repairing wood pavements £6,090, cost per mile £219; cleansing paved streets £19,579, cost per mile £269; cleansing macadamised streets £34,772, cost per mile £66; watering paved streets £892, cost per mile £12; watering macadamised streets £3,592, cost per mile £6 16s. 6d.; gritting paved streets £2,117 19s. 10d., cost per mile £29 2s. 3d.; gritting macadamised streets £77 10s. 7d., cost per mile 2s. 11d. The approximate area of wood pavement maintained directly by the corporation is 202,698 sq. yds., the cost of which during the past year was £1,636 17s. 7d., being at the rate of 1·937d. per square yard.

TAR-SPRAYING.

The total area of macadam surfaces tar-sprayed was 1,771,515 super. yds.; the area sprayed a second time was 32,325 super. yds., making an area of street equal to 1,739,280 super. yds., comparable with a length of 134 miles 1 furlong 182 yds. The cost of the work was £6,803 16s. 7d., being at the rate of 0·92d. per super. yard.

The application of tar to the macadamised street surfaces had effected a saving in repairs, maintenance, and scavenging, and is continuing to give satisfaction.

* Our thanks are due to the company for permission to reproduce Mr. Ritchie's interesting article, which appears in the July issue of *Kahncrete Engineering*.

Institution of Municipal and County Engineers.

EASTERN DISTRICT MEETING AT TILBURY.

There was a goodly attendance at the Eastern District meeting of the Institution of Municipal and County Engineers held at Tilbury on Saturday last. Rain was falling when the members assembled shortly after ten o'clock at Tilbury Dock Station, and were received by the chairman of the urban district council, Mr. Alexander Brennan, J.P.; but the weather cleared off a few minutes later and permitted of the subsequent inspections of works being carried out according to the programme laid down.

An underground convenience which Mr. S. A. Hill-Willis, the surveyor to the local authority, has lately constructed, was first examined by the party, after which a section of Tarmac came in for attention. Passing into the docks the visitors next proceeded to make a tour of the extensions which Messrs. Topham, Jones & Railton have in hand for the Port of London Authority, the chief features of interest in this work being the extensive block-making yard and ballast washing and screening plant, the excavations which are in progress, the construction of quay walls on concrete monoliths, and the new sheds which are being erected. Piles of the "Simplex" type are being made use of in the foundations of the last-mentioned structures. Subsequently the members visited the new river jetty works, the contractors for which are Messrs. Perry & Co. (Bow), Limited, and found much to interest them in the operations of cylinder sinking and pile driving.

Luncheon was served at the Tilbury Hotel. Mr. H. T. Wakelam (Middlesex) district chairman, presided, and there were present Messrs. E. G. Allen (London), A. G. Bates (Hendon), J. Beck (South Ockenden), L. C. Bentley (Tilbury), A. Brennan (Tilbury), T. A. Capron (Tilbury), W. T. Clapton (East Ham), H. Collins (Colchester), E. B. Cook (Chiswick), H. T. Davies (Aylesbury), H. E. Denham (Chiswick), H. S. Denham (Port of London Authority), C. E. Evans (London), S. Farrar (Frinton-on-Sea), G. G. Feeney (Essex County Council), A. Freeman (Rickmansworth), S. C. Gordon (London), W. Gregory (Herts), S. A. Hill-Willis (Tilbury), N. Hoskins (Westminster), A. C. James (Grays), A. O. Laird (resident engineer, Tilbury Permanent Works, Port of London Authority), H. Lomas (Rickmansworth), W. Mackenzie (assistant engineer, Port of London Authority New Works), C. F. W. Marsh (Orsett), H. McDowell (Hendon), A. E. Peake (Essex County Council), P Pittman (London), G. Marlow Reed (Middlesex County Council), E. J. Reynolds (Friern Barnet), J. Rogers (Chadwell St. Mary), A. W. Schelff (Westminster), W. Sheffield (Tilbury), C. Chambers-Smith (Westminster), P. G. Thorly (Southend-on-Sea), E. O. Tompkins (Stanford-le-Hope Parochial Committee), E. C. Wadhams (Tilbury), J. A. Webb (Hendon), hon. district secretary, C. Wilden (Tilbury), E. Willis (Chiswick), F. J. Winter (Southend-on-Sea), and H. York (East Barnet Valley).

The only toast was that of "The King."

The Chairman remarked that they had had a most interesting inspection of the works which the Port of London Authority were carrying out at Tilbury. He was exceedingly surprised to see how the work was being done, and he did not think the institution had ever before seen anything so interesting as the sinking of the monoliths, some 600 tons in weight, on which the new quay walls were being founded. Those members who had been unable to attend that day were to be sympathised with in having missed seeing what had been thrown open to their inspection. They had with them one of the resident engineers, Mr. Laird, and he wished through that gentleman to convey to Mr. Kirkpatrick, the chief engineer to the Port of London Authority, their sincere thanks for the facilities he had given for their visit to the docks; at the same time he desired to express the indebtedness of the members to the several representatives of the Authority for showing them over the works.

A cordial vote of thanks was passed to Mr. Kirkpatrick.

Mr. Laird returned thanks on behalf of the staff at Tilbury for the kind remarks of Mr. Wakelam, and said he was sure Mr. Kirkpatrick would be glad to know the members' journey to the district had been a profitable one, so far as the docks were concerned.

After the reading of the minutes of the previous district meeting—held at Bedford—consideration was given to the following paper:—

TILBURY AND SOME PARTICULARS OF A NEW SEWERAGE SCHEME IN THE ADJOINING RURAL DISTRICT.

By S. A. Hill-Willis,

Engineer and Surveyor to the Tilbury Urban District Council.

[Mr. Hill-Willis served his articles under Mr. W. B. G. Bennett during the time the latter was borough engineer of Southampton, and for the past nineteen years has been continuously employed on municipal work under either State, county borough, urban or rural district authorities. He was appointed first surveyor to the newly formed Tilbury Urban District Council in 1912, having been for some years previously engineer to the Orsett Rural Authority, for whom, in addition to the general routine work, he designed three sewerage and sewage disposal schemes, and carried out by administration a new water supply scheme comprising several miles of cast-iron mains, engine-house and water tower.]

The urban district of Tilbury is one of the latest to be admitted to the ranks of self-governing districts, having been constituted in April, 1912. It has, however, some historic associations, and is also notable for its docks, which accommodate the largest vessels entering the Port of London. . . .

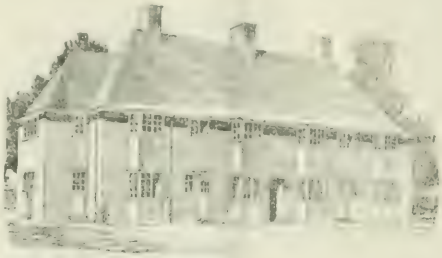
The Tilbury Docks, which were opened in 1886, are now under the control of the Port of London Authority, having been constructed in about four years at a cost of about £3,000,000 from plans by Mr. A. Manning, engineer to the East and West India Dock Company. Additions to the dock accommodation are now being carried out at a cost of about £350,000 by Messrs. Topham, Jones & Railton, under the direction of Mr. C. R. S. Kirkpatrick, M.Inst.C.E., the chief engineer to the Port of London Authority. The extensions include the addition of 1,600 ft. to the South Quay, and three large transit sheds, 550 ft., 600 ft., and 650 ft. long and 120 ft. wide. The present system consists of a main dock with three branch docks, having a total water area of 54 acres. The main dock is now being extended to a length 3,230 ft. and a width of 600 ft.

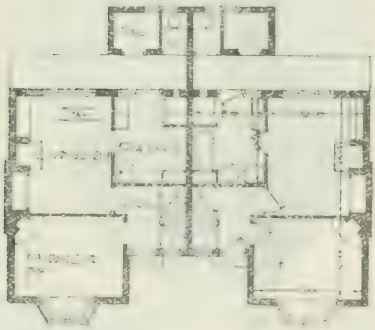
A most interesting piece of work is the construction of the new quay walls, which are being founded on monoliths, sunk to the ballast at a depth of 60 ft. below coping. The docks are connected with a tidal basin by means of a lock 700 ft. long and 80 ft. wide, with a depth of 44 ft. on the outer cill and 38 ft. on the inner cill, which is the depth at high-water spring tide in the main and branch docks. The dry docks here, of which there are two, 846 ft. long, are the largest in the Port of London.

Another improvement, upon which work is now in hand, is the construction immediately south of the dock entrance of a deep-water riverside jetty for the use of cargo steamers.

[illegible] and 50 ft. wide. It is being built in reinforced concrete (Hennebique system), and will receive an equipment of modern electric cranes with capacities up to 3 tons. Railway access to the jetty is now being provided, and the completion of this work will add considerably to the facilities for dealing with cargoes in the river. It is now under consideration to provide to the north of the dock entrance a riverside passenger landing stage on the lines of the Prince's [illegible] at Liverpool. This landing stage according to present plans is to be [illegible] long and 50 ft. wide.

The sewerage system inside the docks is under the control of the urban district council, the total length of sewers being 3¾ miles, with seventy-six manholes.

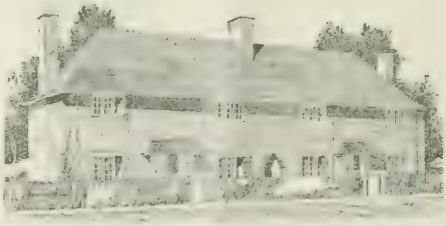


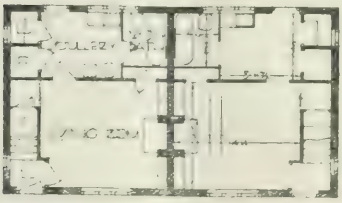


Ground Plan.

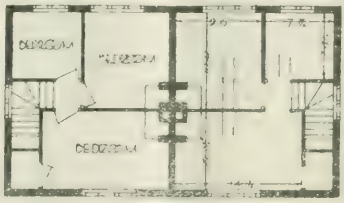
Bedroom Plan.

(Class A.)





Ground Plan.



Bedroom Plan.

(Class B.)

TILBURY WORKMEN'S DWELLINGS: PLATE 3

The Midland Railway Company, who have recently acquired the London, Tilbury, and Southend Railway, have this year completed the purchase of some 48 acres of land, being a portion of the Christ's Hospital estate (Winchester). This land, lying between the Tilbury Railway Station and Pier and the Tilbury

Fort, has river and road frontages and abuts on to the [illegible] company's lines. The place paid a [illegible] per annum. It is expected that the company will now build [illegible] on the river front for their Continental traffic and provide increased railway facilities.

SEWERAGE.

[illegible] 167 [illegible] the South Ward [illegible] the dock area [illegible] 6 in. to 15 in. Minor extensions (1¼ miles, 30 manholes) have been carried out [illegible] the Local Government Board, and out of current expenditure, [illegible] the bulk of this work has been carried out by administration, and [illegible] the nature of the ground [illegible] have been adopted [illegible] with either Hassall's (double lined) or Parker's joints supported on a not less than 6-in. concrete foundation. The manholes in all cases, in addition to 9 in. thickness of brickwork, have a 6-in. concrete backing. In some cases steel wire lattice reinforcement has been laid on the concrete foundation throughout the whole length of the sewer.

LIGHTING.

Up to 191[illegible] the street lamps were maintained by the local authority, gas only being supplied by a company. The average cost of lighting was: North Ward £2 16s. [illegible] per annum, South Ward £4 5s. 2d. per lamp per annum. The average candle-power of the original upright burners (Bray C) was about 60 [illegible] The author has [illegible] prepared a scheme, recently carried out, which included the provision and erection of twenty-four 300-candle power lamps in parts of two of the principal streets, and a 2,600-candle power bracket lamp at the junction of Dock and Calcutta roads. Fifty-nine 100-candle power lamps have been provided and erected in various parts of the district, and all existing 60-candle power lamps have been converted to 100-candle power (Bray inverted burners) and re-erected in approved positions. The maintenance by the council has been abandoned, and a contract has been entered into with the gas company to provide gas and maintain the whole of the lamps for a term of seven years at the following prices:—600-candle power, £10 per annum; 300-candle power, £5 18s. per annum; 100-candle power, £3 10s. per annum.

The hours of lighting in the North and South Wards are from one hour after sunset to twelve midnight all the year round, and the lamps are fitted with automatic lighters of the "Simplex" clockwork type supplied by the Metropolitan Gas Meter Company.

The cost of gas for ordinary purposes in the urban area is 3s. 8d. per 1,000 cub. ft. If by automatic slot meter, the price charged is about 1s. per 1,000 extra, which include a free installation, comprising a meter, cooker, and three lights. Gas for power purposes is 3s. 3d. per 1,000.

UNDERGROUND CONVENIENCE.

The author has designed and carried out by administration an underground convenience at the junction of Dock-road and the Broadway. The cost of the work was £1,040, and owing to the nature of the subsoil careful timbering was necessary. The interior is lined with white glazed bricks; owing to the number of pavement lights, all the water-closets, &c., are exceptionally light by day. About £100 per annum is taken for the use of the water-closets and washes, but two attendants are necessary, and the cost of upkeep, including repayment of loan, is about £300 per annum.

ROADS.

During the years 1900-6 (when the district was under rural administration) some fourteen streets were made up under the Private Street Works Act of 1892 at a total cost of £13,344. The cost per foot frontage in some cases worked out as low as 6s., and in the majority of streets no channels were provided. The form of construction adopted was simply a foundation of large chalk flints topped with a coating of pit gravel and Kentish flints. (Several of these have since been coated with from 3 in. to 4 in. of quartzite or granite.) Norwegian granite kerbs were provided and ordinary ballast paths.

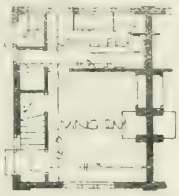
The first set of new streets to be made up by the urban authority is now in hand.

The estimated cost per foot to frontagers as served in provisional apportionment was 8s. 10d. The actual cost will be probably about 8s. The cost of channelling (2s. 3d. per foot-run) is to be defrayed by the council, as channels were not inserted in many of the streets formerly made up under the road authority. The council have adopted the clause which enforces the payment of trade union rate of wages.

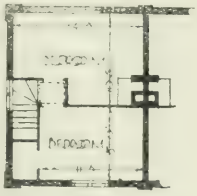
The footpaths in the main streets are paved with Kentish rag tar-paving 2½ in. in thickness, the bottom coat being 1½ in. thick, and composed of ¾-in. to 1¼-in. gauge, the top coat 1 in. thick of ¼-in. to ½-in. gauge; both layers separately rolled, and the surface finished with a sprinkling of Derbyshire spar. The remainder of the paths are gravel, painted with ordinary tar and coated with sand and chippings. This latter is gradually being taken up and Kentish rag-stone tar-paving put in its place. The average contract price is 2s. 2d. per square yard, and about 2,000 sq. yds. are at present laid annually.

Experimental lengths of tar-macadam have been put down near one of the railway stations (Dock Station), also a section of quartzite grouted with bitumen; both have given good results.

The principal trouble in the South Ward at present is the lack of an efficient system of surface-water drainage, and last year the author brought forward



Ground Plan.



First Floor Plan.

(Class C.)

TILBURY WORKMEN'S DWELLINGS: PLATE 3.

a preliminary scheme for dealing with this by means of a main trunk concrete sewer (1 mile in extent) to deliver into the Thames at a point near the World's End, the diameter being 6 ft., and the invert level at its point of discharge—9 ordnance datum. The estimated cost of the new scheme is £28,400, and it is proposed to remodel the existing surface-water drainage, of which there is at present 4 miles, to gravitate into it. Difficulty is, however, met with in securing suitable gradients, owing to the fact that the general surface level of the whole of the South Ward ranges from 4 to 6 ordnance datum. The completed scheme has not yet received the sanction of the urban district council, who meanwhile are marking time, as it were, with regard to any further road construction works. Instructions have now been given for a comprehensive scheme to be prepared dealing with the whole of the district roads in order to meet with the exigencies of modern traffic, including the channelling of the remainder of the streets in the South Ward.

No time will be lost in bringing this new road construction scheme before the council when once the Local Government Board sanction has been received for the surface-water scheme. To carry out the ordinary repairs the council purchased this year an Aveling & Porter roller and tractor (combined plant), and about 2,000 tons of Kentish rag and Jersey granite are being unloaded at the Fort Wharf and hauled to various parts of the district to deal with immediate repairs. Since the purchase of the above plant there is no doubt that a saving has been effected on the contract system, especially in the haulage of materials to the North Ward. The council have their own tar-spraying machine (200 gallons capacity), tar boilers, &c., and all the public roads

in the South Ward were treated in 1912 with coal tar derivatives, with the exception of [illegible] which were treated with Kerbstones. A [illegible] and covered with granite chippings.

The costs were as under: Dehydrated tar, at 2½d. per gallon, covered with fine hoggin, 1s. per yard super. Tarvia, at 4½d. per gallon, covered with fine hoggin, 2½d. per yard super. Kerbstones, A and [illegible], 26s. 6d. per ton, equals 6·1d. per gallon covered with fine hoggin, 2½d. per yard super., with chippings, 3½d. per yard super., water bound road, consisting of Gotham gravel in centre and Kentish ragstone sides, covered with hoggin, 1s. 4½d. per yard.

HOUSING.

Almost ever since the formation of the urban district, the council has been impressed with the inadequacy of housing facilities in their area. About 4,000 persons earn their living at the docks. Over 2,000 of them take tickets between the docks and places as far up the line as Fenchurch-street and for Gravesend. In addition to this, when the improvements now in hand are completed, it is estimated many more hands will be employed. There is not a single empty house in the district. Tilbury intends to be self-sufficing—hence the housing scheme. The council also wish that the houses to be provided shall not only be useful and economical, but also beautiful and in pleasant surroundings, and to this end has had a comprehensive scheme prepared by the well-known town planning architects, Messrs. Pepler & Allen, F.S.I., F.R.I.B.A., of Arundel-street, Strand, in conjunction with the author. This scheme, which has been approved by the council, and tendered for, now awaits the sanction of the Local Government Board, and embraces altogether 234 houses to be built of brick with tile roofs. The brick to be used is three shades of brindled red sand, faced with lighter quoins from Messrs. Collier, of Marks Tey, pointed in cement outside, and the roofs covered with red sand-faced tiles. The area of land utilised for the present housing scheme equals 15½ acres, and for future housing the council are acquiring 11¼ acres. The houses are divided into three classes.

Class A.—Containing living-room, parlour, scullery, bath, and three good bedrooms. Nett rent 6s. 8d. per week; with rates and taxes, 9s. 3d. per week.

Class B.—Containing living-room, scullery, bath, and three good bedrooms. Nett rent, 5s. 2d. per week, with rates and taxes, 7s. per week.

Class C. Containing living room, scullery, bath, and two good bedrooms. Nett rent 4s. per week; with rates and taxes, 5s. 3d. per week.

Average cost of cottages, 7d. per cubic foot, excluding sewers and roads. The scheme comprises three groups of houses, two being in the South Ward, near the docks, and comprising respectively 100 and 104 houses, and one in the North Ward, consisting of thirty houses. The South Ward groups contain fifty of Class A and fifty of Class B, in blocks of fours and pairs, and 104 of Class C in blocks of eight and four. That in the North Ward comprises only pairs of Class A.

Open spaces are provided, and the houses are pleasantly grouped, and each set should comprise an agreeable settlement.

There are many difficulties to contend with, as all the South Ward of Tilbury is low and the ground is unstable, and reinforced concrete rafts were necessary for the cottages. In the North Ward, owing to the hills, the gradients of portions of which are as steep as 1 in 8, the cost of carting is high.

Despite these difficulties, it will be found the rents to be charged are well below the local average for similar accomodation, and the cottages more pleasant and agreeable in themselves and in their surroundings, and much better built on proper foundations, even when building is far more costly than when the existing cottages were put up. The reason for the grouping is partly governed by the shape of the district, which is long and narrow, running up from the Thames on the flat for about two miles to the hills.

The South Ward comprises all the flat land and the North Ward upland. The desire of the council being that their district should grow out to the hills, they have made up and lighted the Manor Way, which is the road leading to them, and are erecting on the highest ground 30 superior cottages in pairs. These cottages are likely to be taken by those workmen whose shorter hours allow time for the journey to and fro the docks. The reason for the greater number in the South Ward is nearness to the docks for those who work there. In time, no doubt, houses will extend from the flats to the hills, and buses or trams will make the journey to the docks a very small matter.

Having this in view, the council are, with wise foresight, in conjunction with the housing scheme, obtaining 20 acres [illegible] land for park and recreation ground and 29 acres for additional allotments. The proposed charge for the new allotments is 6d. per rod per annum, which is the same rental as those at present in use. Owing to the wide and deep ditches surrounding the land proposed to be laid out for allotments no serious scheme of fencing will be necessary.

STANFORD-LE-HOPE MAIN SEWERAGE AND SEWAGE DISPOSAL WORKS.

In 1910 portions of the parishes of Mucking and Horndon-on-the-Hill near the Stanford-le-Hope railway station were added to the parish of Stanford-le-Hope and a new sewerage system designed to serve the added areas in addition to new estates in the original parish. At the same time the old contact beds at the works were found to be inadequate, and to bring the system to a state of efficiency it was found necessary to lay down an entirely new works on more up-to-date lines.

The new scheme, which was completed last year at a cost of £12,228 (excluding easements), comprised:

(1) The laying of 4½ miles of sewers.

(2) The laying of a rising main and air mains from the pumping station to the disposal works.

(3) The provision of oil engines and air compressors at the pumping station, with enlargements of existing engine-house.

(4) The provision of ejectors at the outfall works to lift the high level sewage to the new tanks

(5) The construction of continuous flow settlement tanks, percolating filters, sand filters, storm-water filters, and sludge drying beds.

The present population of Stanford-le-hope is 2,500. The dry weather flow of sewage in connection with the scheme was taken at 20 gallons per head per day. The sewerage system takes in rainfall from roofs and paved yards, but not from road gullies. Therefore the sewage may be considered as strong, especially as there is scarcely any subsoil water in the sewers. A brewery and a laundry are connected.

The original sewered area was divided into two districts, one being the high level, from which the sewage gravitated to the beds, and the other, quite a small portion in comparison, being the low level, the sewage from which was lifted at the pumping station through a short length of rising main and discharged into the high level sewer.

Under the new scheme the populations draining into the high and low level became equal—viz., 1,250 in each, and the length of rising main through which the sewage was lifted from the low level to the high level was therefore abandoned and a rising main 635 yds. in length laid, through which the sewage is lifted from the low level direct to the new separating chamber at the works. The existing 15-in. diam. high level sewer, after having received an addition, still gravitates to the works, but the sewage on arrival is lifted by means of ejectors (2-50 gallons each capacity) to the new separating chamber, where it delivers side by side with that of the low level.

For the sewers the future population was taken as 5,000 in each district. On this basis the low level sewer is capable of discharging about nine times the mean dry-weather flow and the high level sewer about sixteen times.

OUTFALL WORKS.

The new outfall works are designed to deal with a population 25 per cent. in excess of the present population of 2,500.

Detritus Tanks.—No. 2 are provided each 6 ft. by 4 ft., which approximately equals 1-100th of dry-weather flow.

Continuous Flow Settlement Tanks.—No. 3 provided total liquid capacity equals 52,906 gallons is 84 per cent. of the dry-weather flow of 62,500 gallons.

Percolating Filters.—No. 3 provided containing together 1,143 cubic yds. of filtering material. Taking the dry-weather flow of 62,500 gallons per day, filtration rate of 55 gallons per cube yard per day is attained, or if the quantity from the brewery and laundry is added, the rate is 59 gallons per cube yard per day.

Humus Chamber and Sand Filters.—From the filters the effluent passes through six humus chambers over

[illegible] distributing channel communicating with six sand filters each of which is 117 sq. yds. area. From the sand filters the effluent passes to outlet chambers, the level of the inverts of which are 11·0 ordnance datum. From these it passes along a culvert carrier direct to the tidal stream.

[illegible] pumps capable of dealing with [illegible] volumes of the dry weather flow from the present population. There [illegible] six volumes will be [illegible] before the storm water backs up in the pump well and goes over the overflow, the level of the invert of which is [illegible] ordnance datum, and before the level is reached [illegible] 4,200 ft. of 12-in. pipe and 2,300 ft. of 9-in. pipe will be [illegible]. This added to the [illegible] in the pump well is equivalent to about seven hours flow of six volumes of the present dry-weather flow.

Storm Water, High Level District.—At the entrance to the sewage [illegible] the storm water works, a weir is placed limiting the flow passing to the tank to three volumes of sewage and to allow for a population 25 per cent in excess of the present. Any excess above this first three volumes passes to a stand-by tank having a capacity of twenty-nine [illegible] of the dry-weather flow. From the stand-by tank the storm water passes to a distributing channel to No. 3 storm-water filters, each [illegible] 234 sq. yds. area, giving a total area of 702 sq. yds. From these filters the effluent is passed on to an irrigation area of three acres, and thence to the tidal stream.

Details of Construction.—The majority of the sewers were composed of first quality stoneware socketed Hassall's pattern pipes, with double-lined joints jointed with plastic and liquid cement laid on a concrete foundation. About one mile of sewer in the low level was specified to be of 12-in. dia. cast-iron pipes jointed with white hempen spun yarn and pure lead laid on a concrete foundation 2 ft. wide by 6 in. in depth. Owing to the treacherous nature of the ground (running sand) opened up all through this section, the author ordered double decking to be placed under the concrete at an extra cost of 5s. 6d. per yd. lineal. The double decking consisted of four widths of 9 in. by 1½ in. yellow deal fixed longitudinally in trench with 9 in. by 1½ in. fixed crossways over the whole trench bottom. The cost of this sewer laid, excluding manholes, was 26s. per yard lineal. The sewers had to be carried through the railway of the Midland Company (L.T. & S.R. section) in two places, including the Stanford-le-Hope railway level crossing. The sewers commissioners have control over the stream, and the Stanford-le-Hope bridge is the property of the Essex County Council. An accompanying plate No. 5 shows the requirements of some of these authorities.

Manholes.—The manholes are built in 9-in. and 14-in. brickwork (Flettons) in cement mortar, and rest on a concrete foundation, and are surrounded with concrete. The benchings are formed in concrete rendered in cement, and the inverts of half-glazed channels.

Disposal Works.—The floors and interior sides of [illegible] and channels are formed of concrete finished with a ¼-in. topping of cement mortar while the concrete was [illegible]. The walls are formed with [illegible] fixed brick. The filtering medium at the bottom of filter for a thickness of 1 ft. was broken [illegible] to pass all [illegible] through a 1-in. mesh, and be rejected by a [illegible] mesh. The remaining filter medium is composed of clinker or [illegible] to pass [illegible] through a 2½-in. mesh, and be rejected by a 1½-in. mesh. The distributors are of the rotary type to suit beds 54 ft. diameter, and are capable of dealing with a minimum flow of 25 gallons per minute and a maximum of 100 gallons per minute. The medium to bottom of sand filters is composed of fine sharp, coarse gravel, and the medium above the latter consists of Leighton Buzzard filter sand 12 in. in thickness.

The contractors for the sewers and works were Messrs. W. & C. French, of Buckhurst-hill, the contractors for machinery, ejectors and air mains being Messrs. Tuke & Bell, Ltd.; Mr. L. L. Todhunter acted as clerk of works, and Mr. G. Hayward as inspector of works.

REPORT

on the examination of a sample of sewage and effluent from the new works by Dr. John C. Thresh, Medical Officer of Health, Essex County Council, September 17th, 1913.

(1) Sewage entering Stanford-le-Hope Sewage Works.
(2) Effluent leaving " " " "
(Results in parts per 100,000).

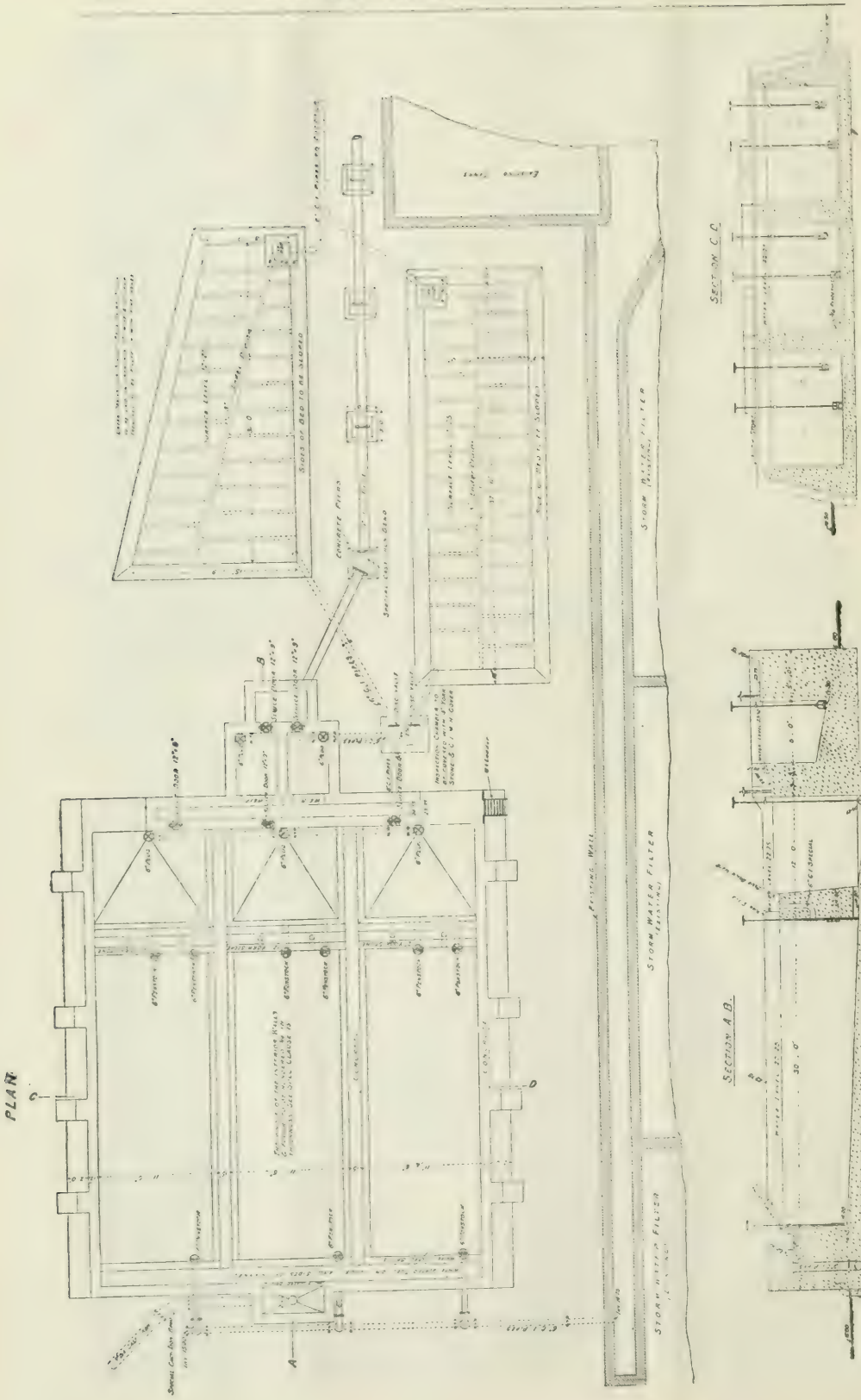
	1.	2.
Colour	Black	Yellow
Odour	Offensive, strong	Faint, earthy
Turbidity ..	70–80	1·5
Suspended matter .	Large amount	Under 3 pts. per 100,000
Chlorine	14·4	16·2
Nitrites .. .	0·0	Present
Nitrates and nitrites	0·0	1·2
Nitrogen as free ammonia ..	7·45	3·70
Albuminoid ammonia	7·8	0·20
Oxygen absorbed in 4 hours	18·61	1·61
Dissolved oxygen absorption in 5 days (R.C.)...	[illegible]	1·5
Impurity figure .	2·[illegible]	[illegible]
REMARKS.—	On Royal Commission basis impurity figure is 18·6. Sewage therefore is a "strong" one.	After bacteriolation of 57 C.c. sample had undergone no change or developed any tendency to become putrid.

To convert results into grains per gallon multiply by 7.

In conclusion, the author wishes to express his thanks to Mr. C. R. S. Kirkpatrick, M.I.C.E., chief engineer to the Port of London Authority, for his kindness in granting permission for the new dock works to be visited, and arranging for some of his staff to show the members of the institution around the new works, also to the chairman and members of the

STANFORD-LE-HOPE SEWAGE DISPOSAL WORKS: GENERAL PLAN.

(Scale, 64 ft. to an inch.)



Stanford-le-Hope Sewage Disposal Works: Tanks and Sludge Beds.
(Scale, 12 ft. to the inch.)

Orsett Rural District Council for permitting the Stanford-le-Hope sewage disposal works to be viewed, and Major Crookshank, R.E. (Officer Commanding Royal Engineers), for granting permission enabling the Seventeenth Century stone gateway and septic tank installation at Tilbury Fort to be inspected. He would also like to acknowledge assistance in preparing this paper rendered him by officers of the Orsett Rural Authority, including Mr. F. T. Johnson, highway surveyor, and the author's former pupil and assistant, Mr. C. F. W. Marsh, engineering surveyor.

DISCUSSION OF MR. HILL-WILLIS' PAPER.

Mr. E. Willis (Chiswick) said he had had the pleasure of knowing Mr. Hill-Willis for a good number of years, and had watched the steady rise he had made in the profession. The District Council of Tilbury were fortunate in having him as their engineer, and the institution on having that paper from him, and in giving a very hearty vote of thanks to him he was sure it would be received with acclamation. There was one matter that appealed to him, and would, he thought, appeal to everyone in that room. Mr. Hill-Willis had mentioned in his paper that there was not a single empty house in the district—a most exceptional position for any district council to be in, and a great help to any local authority in regard to the receipts from the rates. It was a record upon which the council and its officers were to be congratulated. They had been fortunate in the visits which had been arranged on their behalf—particularly those in the docks area. He believed it was the only place in England where the monolithic construction which they had an opportunity of viewing that morning could be seen on such an extensive scale. The difficulties that had existed in the past in connection with that particular dock extension were well known. With regard to the ferro-concrete construction that was being carried out by Messrs. Perry & Co., it was a pity that it was not low tide at the time of their inspection, but the general scheme was an education in itself for those who lived in places where miniature docks were under their control. As to ferro-concrete work, he was not a believer in that for everything, but it was an ideal method of construction in some positions, and that was one where its utility had been made use of to the utmost.

Mr. J. A. Webb (Hendon) said he had very great pleasure in seconding the proposition to thank Mr. Hill-Willis for his very excellent paper and for the trouble he (the speaker) personally knew he had taken to make that meeting a success and give the members some insight into work they did not see every day. Mr. Hill-Willis had stated that the average cost of his cottage was 7d. per foot, exclusive of sewers, roads, &c., and it would be interesting to know what was the cost inclusive of those items. On behalf of the institution he desired to express cordial thanks to Mr. Brennan, the chairman of the district council, for attending that meeting and giving them his help, and to the council generally for the facilities they had given them in connection with the visits. He thought the local authority were to be congratulated on realising their responsibilities in the matter of the provision of dwellings for the workmen engaged in the district. By doing that they were anticipating and providing for the future. Their thanks were also due to Mr. Tompkins, chairman of the Stanford-le-Hope Parochial Committee, for attending their meeting. The Stanford sewerage scheme was an ideal one for a small population.

The vote of thanks was passed.

Mr. Alexander Brennan, chairman of the district council, said he did not think anyone was more worthy of their respect than Mr. Hill-Willis, who was an ideal surveyor.

Mr. Hill-Willis, in reply, observed that as far back as twenty years ago, when a pupil at Southampton, he had looked forward to the day when he would be in a position to receive the institution. That day had now arrived, and he trusted the visit would prove of interest to them all, and that they would not regret the time they had spent in the district. He very much regretted the absence of the chairman of the rural district council, who had unfortunately been prevented from attending, but he was very pleased to find the chairman of the urban district council had found it possible to be present, and he thanked him very much for the kind remarks which he had made concerning himself (the speaker). The chairman of the Stanford-le-Hope Parochial Committee was present, and he was glad he had seen fit to come, especially as he had recently had a very severe accident. Mr. Webb's question as to the cost of the houses was very difficult to answer. He had really asked for an analysis of the prices, and he could only give the information by referring to the priced quantities. Otherwise they would be misleading.

[Mr. Hill-Willis has since furnished us with the following statement: "In reply to Mr. Webb, who asked for cost of roads, and sewers, &c., in connection with the housing scheme, I have now had an opportunity of further examining the priced quantities, and the costs are as follows: Cost of House, Class A, £275; Cost of House, Class B, £239; Cost of House, Class C, £168. The cost of fencing, roads, paths, soil and surface water sewers, &c., is, £8,564 8s., or £36 12s. per house in addition. Out of this amount of £8,564 8s. a sum of £4,539 is not, however, chargeable to the housing scheme, as this expenditure represents the channelling of roads and laying of sewers, which work is by practice in this town borne out of the general district rate."]

During the afternoon the members visited the adjoining rural district of Stanford-le-Hope and inspected the sewage disposal works described in Mr. Hill-Willis's paper. In returning, the sites for the new workmen's dwellings were passed.

Later the party were entertained to tea by Mr. Hill-Willis at the Tilbury Hotel.

THE CHELTENHAM MEETING: GENERAL ENGINEERING SUBJECTS.

Following the proceedings reported in last week's issue, Mr. T. Caink, assoc.m.inst.c.e., presented a paper dealing with Worcester Sewage Disposal Works. The paper in question is reproduced on p. 176 of this issue.

DISCUSSION OF MR. CAINK'S PAPER.

Mr. E. J. Silcock (Westminster) said he had great pleasure in proposing a vote of thanks to the author of this paper because Mr. Caink had treated the subject, as he always did, with a great amount of originality of thought. This paper was of very great interest. It presented the subject to them in a new light, and Mr. Caink had not taken anything for granted, and had not slavishly followed what had gone before. He should confine his remarks to the question of sewage purification, but should refer incidentally to the pumping plant that was provided. They were told that the pumping plant was of three units—of 2,000,000 gallons, 4,000,000 gallons, and 6,000,000 gallons capacity respectively. If they were restricted to three units those units should be of the respective proportions given. But he ventured to say that those units should be larger than in this particular instance. The dry-weather flow was 2,000,000 gallons a day, so when the three units were working together they could only pump six times the dry-weather flow, with no stand-by. In his opinion the small unit, instead of 2,000,000 gallons, should have been 4,000,000 gallons to lift the dry-weather flow; the second unit of 4,000,000 gallons should have been 8,000,000 gallons, so that the first and second units could have pumped six times the dry-weather flow; and, in the alternative, the third unit should have been 12,000,000 gallons, so that, working alone, it could lift six times the dry-weather flow, and be able to deal with the whole of the storm water. Passing on to the sewage purification, the author had endeavoured to introduce a system which would involve practically the doing away with sludge, as they knew it, and the production of a continuous system of purification. The system that Mr. Caink had put down—apart from what he had referred to in his opening remarks—was to a very great extent similar to a system of purification experimented upon at the Leeds works some years ago, and dignified by the name of the Leeds system, by which fresh sewage was pumped direct on to bacteria beds, and the whole of the suspended matter was put through the bed and subsequently removed by a sand filter, which was intended to act as a screen. Mr. Caink seemed to have a very similar system, because his tank treatment was only a two and a-half hours' storage. It was really only two hours' storage on the dry-weather flow, and therefore at the average rate of flow the sewage went on to the oxidising beds in a comparatively fresh state. That system was one which could be perfectly well carried out,

[illegible] and it had very great advantages, one of which was [illegible] fresh sewage [illegible] and in this way avoided the possibility of [illegible] the tanks and the distribution of the sewage on the beds. Because, as they knew, fresh sewage had very little smell. Further, [illegible] the accumulation of large quantities of [illegible] after this matter had passed through the beds it became to a large extent oxidised, and when separated from the liquids by the sand filters, could be dried easily without any nuisance. This system was tried and found successful, and he applied it to some works which he had been in operation for the last six years. The only objection to it was that it was more costly than the tank process. Where they wanted to establish works in the immediate neighbourhood of houses, or where land was very expensive, that was a system which could be applied and carried on without creating nuisance; but their works must be larger than if they had the tank system of separating the solids before passing on to the beds. That increased the cost of installation. Unless they had circumstances which compelled them to do it, this system was not one which they would adopt from the economical point of view. Taking the principal features of this scheme, the first step appeared to be, in Mr. Caink's case, the breaking down of the grosser suspended matter by means of roughing filters, in which the sewage as it went to the secondary pumps was passed through [illegible] gravel and sand in succession. That step was [illegible] it up into fine particles, otherwise they would always be clogging the surface of the bacteria beds and choking up the sprinklers. That was one of the very essential steps to carry out. If that step could be successfully done in the way Mr. Caink suggested, well and good. He thought very likely for a purely domestic sewage the system he adopted would be quite satisfactory. In manufacturing districts and especially where the textile trades were carried on, the sewage contained too much fibre for the process to be effected by means of gravel beds, as at Worcester. It was found they required some kind of revolving screen which would intercept the fibre, and from which the fibre could be removed. The next point to which he wished to refer was with regard to the size of the medium used in bacteria beds. They found that, in order to get this system working properly, it was no use attempting to arrest the suspended matter until after it had been through the oxidising beds, and the beds must be constructed of material large enough to allow everything to go through. In order to do that they were compelled to have the beds of greater depth than when dealing with a similar process with tanks, otherwise the sewage passed through it too quickly to allow the oxidising process to go on. They must have a bed of 10 ft. in depth, and the material so large as to allow the suspended matter to go through as easily as possible. Having got it through, they could separate it by the sand filter, and when separated it was perfectly innocuous, and there was no difficulty in dealing with it. Instead of having part [illegible] sludge [illegible] the tanks [illegible] bacteria beds they had a small tank deposit, because they had a reservoir to take all the night flow of sewage. A small deposit took place there, and was the only sludge they had on those works in the ordinary sense at all. Now, with regard to the suggestion Mr. Caink had made with regard to dealing with the sewage by means of a continuous upward flow through the bacteria beds, in order to get the solid matter through the beds in an upward direction they were bound to have sewage passing through at a very considerable velocity. They were working against gravity. In the case he referred to they were working with gravity; every time a particle of deposit got moved it went a little lower down. Passing the sewage in the upward direction they must have a velocity of 2 or 3 ft. per second to push the suspended matter through the bed. If the sewage was to pass through a bed at that velocity it would not have time to be purified at all. It seemed to him the proposition was a sound one [illegible] bed, they were going to push a fresh quantity of suspended matter up [illegible] done this it would be on the surface and in the liquid, and consequently there must be a third process of downward filtration to separate what had been pushed through the second filter. Those two objections seemed to [illegible] they could supply oxygen by artificial means, septic conditions would be set up in this filter-bed, and they would not have an oxidising process at all. Attempts had been made at one or two places to oxidise sewage by blowing air through it. He was told that Dr. Fowler was carrying on experiments at Manchester by which he hoped to do away with bacteria beds altogether. In the Manchester experiments air would be blown direct into the sewage, and there would be no bacteria beds at all. The difficulty was that the air being blown in escaped in bubbles, and did not mingle with the whole of the sewage. In other words, they could not bring the oxygen into intimate contact with the oxidisable matter in the liquid by blowing air through it. It was to overcome that difficulty that the trickling or percolating filter had been introduced. It was to bring the liquid and the oxidising matter into immediate contact with the bacteria, and those bacteria into immediate contact with the air. Every time the suction had stopped the air went in, and gave the bacteria a fresh start. If, on the other hand, the bed was permanently waterlogged every time they stopped the blowing process the supply of oxygen ceased, and septic conditions would be set up again. It was never safe to prophesy, but he did venture to think that the continuous upward working on the lines suggested by Mr. Caink would not be satisfactory for very long. On the other hand, he thought the works, as Mr. Caink had described them, would be good and satisfactory.

Mr. J. A. Webb (Hendon) thanked Mr. Caink for the very able description of the works, and Mr. Silcock for the graphic criticism he had given.

Mr. A. J. Price (Lytham) said, having been at Worcester five years, he claimed to have some little knowledge of this question, especially as he was there when the first part of the work was carried out as the result of a competition. He was one of the competitors. He wished to refer particularly to the syphon under the river. The proposal for carrying the sewage under the river from one side to the other in the form of an inverted syphon was the result of a scheme adopted by a well-known engineering firm. After the syphon was put in it was found it would not work. This was due to causes which were most interesting to every engineer. As Mr. Caink described it, the concrete shafts had their outlets at a height of 36 ft. above the inverts of the pipes into a chamber. The method adopted was to take the sewage from the west to the east side of the river by two 20-in. pipes in a cast-iron pipe of 6 ft. 6 in. diameter. The velocity in the 20-in. pipes was something like 3 ft. per second. These pipes discharged into a chamber 4 ft. [illegible] It was a simple calculation to find the difference in the velocity between 20 in. and 4 ft., and they got the velocity of 3ft. per second in the the 20-in. pipes reduced in the 4-ft. chamber to one-seventh. That was the primary cause of the syphon not being able to work. Mr. Caink had foreseen this from the beginning, and the method by which he got over the difficulty was by making the pump well at the pumping station the ascending leg of the syphon, which could be lowered at will by pumping, and therefore could be kept perfectly clear. This was one of the most interesting engineering mistakes he had known to take place. With regard to Mr. Silcock's suggestion as to doubling the pumping capacity, he said that they could not afford to put in pumps which were more than required by the Local Government Board. The Local Government Board did not require a pumping capacity of more than six times the dry-weather flow, and he thought if they were to put in the capacity of twelve times the dry-weather flow they would get the order of the sack.

Mr. Caink, in reply, said he was not in agreement with Mr. Silcock as to the desirability of laying down larger units. Engines and pumps running at half their load did not conduce to economy of working. He should certainly prefer, if increase were needed, to add to their number rather than their size. With regard to the proposed method of purification by upward filtration, Mr. Silcock was of opinion that to remove the solids from the filter a velocity of 2 ft. to 3 ft. per second would be required, and purification would be absent. If it were desired to remove the solids immediately they entered the filter, he agreed,

but the reverse of that was desired. What was sought was to detain the solids for a time in the filter, and allow the liquid to separate from them and continue its upward course through the filter. The subsequent slow removal of the solids then became a matter not of velocity, but of pressure—pressure to drive them through the interstices of the filtering medium against the resistance of the medium. That pressure might be applied at a rate as low as desired, and, of course, would vary directly as the quantity of liquid discharged through a given area of filter. The actual rate in practice would probably not be many inches an hour. The maximum pressure needed to force the solids through against the resistance of the material would be the specific gravity of the mass of the medium multiplied into its depth. A head of water equal to twice the depth of the filter applied to the underside would be sufficient to lift the entire mass and force anything through it. Mr. Silcock expressed the view that the waterlogging of the filter would induce septic action and prevent aërobic purification. But was not the absence of such purification from waterlogging due to the absence of oxygen? If it were, and he supposed it would be generally conceded, then the presumption was that a sufficient supply of oxygen would restore the purification. With regard to the short circuiting of the air, he proposed to prevent that by pumping directly into the main conveying the tank effluent to the filters, and sending the mixture of air and liquid to find their escape together upward through the interstices of the material. He did not think short circuiting by that arrangement would be possible in an appreciable degree. In any case the air must pass through the entire depth of water and medium before it found its exit into the air. Mr. Silcock thought that in order to arrest the finally digested solids a tertiary bed would be required. With a little reflection, however, he would see that when these solids had been driven up through the secondary sand beds, the water might be decanted off from the surface of these beds at a speed slow enough to deposit any suspended matter, the speed depending upon the area of filter and depth of water flowing over the surface; in other words, upon the volume of water moving towards the outlet.

(To be continued.)

SOME RECENT PUBLICATIONS.*

Building Construction Drawing. Part I. By R. B. Eaton. Price 1s. 6d. nett. London: E. & F. N. Spon, Limited.

This little work consists of a series of twenty-six plates illustrative of elementary building construction. The drawings are very clear, and dimensions are given in all cases. Short specifications are appended to many of the drawings, a feature the practical utility of which will be readily conceded. The author is the lecturer on Building Construction at the Poole School of Art and Technology, and writes as a teacher primarily for the student.

Goodwill: Its Nature and How to Value It. By P. D. Leake. Price 1s. 6d. nett. London: Gee & Co.

This pamphlet deals with a subject which is of great importance to all who are concerned with the management of profit-seeking undertakings. The author is a chartered accountant of great experience, and speaks with authority on a difficult and highly technical subject.

Divining Rod Tests.—In the presence of the chairman and members of the Haslemere Urban District Council, Surrey, the Rev. J. S. Leake, vicar of Grayswood, and Colonel Glennie carried out a series of tests as water diviners at Blackdown on Tuesday. It is stated that they first traced roughly the line of the three principal headings from which water is now obtained without any previous knowledge of the site. Then at another part the divining rods strongly indicated the presence of water running in three main streams. At one spot the movement of the divining rod in Colonel Glennie's hand was so strong that the rod snapped. The authorities are seeking to augment the public water supply.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why was advantage not taken of the opportunity to carry out a "street improvement" when the new offices of the Middlesex County Council were erected at the east end of Victoria-street? Would it not have been possible, without sacrificing any space, to have so adjusted the frontage of this building that the entrance to Little Sanctuary need not have been a wide and ugly funnel, and that the "pinch" opposite the Abbey might have been greatly improved? Why is it that so many improvements in London are spoilt for want of a little forethought and prearrangement between the interested parties?

* * * *

Are we not all agreed that the policy of the Road Board, as expressed in their recently published report, is the right one—viz.: "That the most pressing and the most universal need is the strengthening and improvement of the crusts [which include foundations as well as surface coatings] of existing roads"? Is it not very satisfactory to find that the Road Board have during their short life already exceeded the most sanguine expectation as to their activities?

* * * *

When will the great inconvenience of the Committee Rooms of the Houses of Parliament be altered? Is it not a fact that they are now utterly inadequate in their accommodation, and that most of the witnesses have to stand for hours before they are "called," and that, although it may be very comfortable for the Committee and for counsel, the rest of the "crowd" have a most uncomfortable and trying time of it? Can a witness be "at his best" after such an ordeal? Is it a fact that, notwithstanding this well-known inconvenience, it is now proposed to give the overworked Members of Parliament further "lounge rooms," while the Committee rooms are to be left untouched?

* * * *

Has not the time arrived when there should be additional facilities provided for the purchase of postage stamps at some of the larger post offices? Do we not find that the sale of Insurance stamps has reached such gigantic proportions that the would-be purchaser of "postage" stamps has often to wait a considerable time before his wants are attended to? Would it not be better to have a special counter marked "Insurance stamps" and another "Postage stamps"?

* * * *

Apropos of the proposed tax on motor omnibuses using the new Great West Road out of London, in order to meet the cost of maintenance, why should not horses and other animals using this road be taxed, as they are the primary cause of the cost of scavenging?

* * * *

How many surveyors have read Lord Justice Fletcher Moulton's splendidly worded judgment in the Appeal Court on the Billericay Rural District Council and the Poplar Guardians' case, in which he pointed out that the present "law with regard to the user of our roads is that every member of the public is entitled to use them properly as much as he needs"? How does this apply to the restrictions which are to be placed on the free use of the new Great West Road?

* * * *

How does the Legislature which imposed a tax on the omnibus for using this road reconcile its action with the following further words used by Lord Justice Fletcher Moulton: "The community have come definitely to the conclusion that absolute freedom of user, coupled with communal upkeep of the roads, is the wisest thing for the nation"?

* * * *

Is not the imposition of a tax on the motor omnibuses using the proposed new road rather in the nature of a confession that the road engineer is unable to construct a road which is capable of withstanding the requirements of modern traffic, and is this really the case? Was there not in the minds of those who suggested this tax some ulterior motive beyond the mere desire to impose such a restriction on legitimate traffic?

Royal Sanitary Institute Congress at Blackpool.

SEWAGE DISPOSAL QUESTIONS.

Several interesting papers on matters connected with sewage disposal were read in the Engineering and Architectural Section at the recent congress of the Royal Sanitary Institute at Blackpool. One of these, by Mr. J. F. Parris, Consulting Engineer, and Dr. E. H. Black, dealt with

SOME CONDITIONS AFFECTING THE PURIFICATION OF POLLUTED RIVER.

Dr. [illegible] stated that in the course of a series of investigations of the oxygen content of the River Cam [illegible] the Cambridge Sewage effluent [illegible] several conditions which influence the degree of pollution and purification of the river. [illegible] the amount of oxygen dissolved in the river at 100 ft. above the effluent outfall, that which was observed in the effluent itself, and also the amount in the mixture of the effluent and river, 50 ft. and quarter mile below the outfall. The samples were taken at depths of 1½ ft. and 3 ft. in the middle of the stream, and they were analysed again after five days incubation at 18 deg. Cent. to see how much oxygen had been taken up. The observations were continued from May to December, 1913, inclusive, so that the seasonal changes could be surveyed.

The outstanding results showed that three influences at least could be selected which affected the amount of oxygen dissolved in the stream and its absorption. These three influences were (1) the varying amount of the rainfall, with which is connected a considerable amount of pollution, (2) the number of hours of sunshine, with which is connected the purifying effect of the oxygen given out by the aquatic plants under such influence; and (3) the changes in the temperature of the water (and therefore closely allied to the second factor), with which is connected the varying amounts of oxygen which water dissolves from the air at different temperatures.

It seemed as if there were a kind of balance. In the summer months the lessened solubility of the oxygen in the river, caused by the higher temperature, was more than compensated by the increased discharge of oxygen from the aquatic plants; and the increased solubility of the oxygen in the winter months, caused by the lower temperature, partly compensated for the lessened discharge of the oxygen from the plants. There could hardly be any doubt however that the purification of polluted streams was assisted, not only by the oxygen from the air and from such plants as might be growing in the river, but also by the absorption by such plants of various dissolved constituents like ammonia salts and nitrates, as had been clearly shown by Letts in his investigation with *Chlorella vulgaris*.

SELF-PURIFICATION OF A RIVER IN AN INDUSTRIAL DISTRICT.

In a paper on this subject Mr. James Crabtree, M.SC., A.I.C., pointed out that in the eighth report of the Royal Commission on Sewage Disposal, recommending new standards of effluents based on observations of several rivers, no mention was made of the position of authorities situated on rivers whose waters exceeded their proposed limiting figure of 0·4 parts dissolved oxygen absorbed per 100,000. Only two of the rivers under their observation come under this category (the Ray and Brent), and no specific reference was made to them.

Most of the rivers passing through congested manufacturing districts must, on account of their frequent pollution by domestic and trades wastes, come under this class; indeed, it was doubtful if many of them could ever be brought up to the commission standard. The river Mersey in Lancashire would be classed as a "bad" river by the Royal Commission, and it was to a four-mile reach of this stream near Manchester that the remarks below apply.

"Previous to arriving at this stretch, the river has flowed about 50 miles, and received sewage effluents from many towns (chief of which are Stalybridge, Ashton-under-Lyne, Hyde, Denton, Stockport and Glossop), in addition to factory wastes; and, as the flow in dry weather amounts to about 30,000,000 gallons per day, so far as can be gauged by the eye, a considerable fraction of this amount must be sewage-derived liquor.

The river varies in width from about 25 to 75 ft., in depth from 2 to 12 ft., and has an average velocity of about 2·5 ft. per second, being thus a "very rapid" river according to the Royal Commission's scale. The water-level rises several inches in the afternoons, and after a fall of rain the river swells rapidly. The banks have been raised to prevent floods. The water is brown and turbid in appearance, and fungoid growths are present on the bed and sides of the stream. In dry weather the dissolved oxygen content averages between 10 and 20 per cent. saturation, and is sometimes *nil*, and above the sources of pollution to be considered (*v. infra*), the dissolved oxygen absorbed in five days at 65 deg. Fah. averaged 1·7 parts per 100,000, and sometimes reached 3·00. Yet though the average temperature of the water during the observations was 60 deg. Fah., the water never gave rise to aerial nuisance, was always non-putrefactive on incubation, and contained some nitrate. The condition of the bed, however, left something to be desired, for spells of dry weather resulted in the accumulation of a black deposit, particularly in slack water, and this when stirred up by the next flush following rain gave rise to some odour for short periods.

"In the four miles between Chorlton and Urmston three sources of pollution occur:—

"(1) The Chorlton Brook, 5,000,000 gallons per day, mainly of effluents from the Manchester Corporation's Withington and Gorton Sewage Works, and averaging: Dissolved oxygen absorbed in five days 5·08 parts per 100,000; 4 hours oxygen absorbed from permanganate 3·55 parts per 100,000. (2) 1,050,000 gallons weak precipitation effluent from the Sale sewage outfall, but whose effect was found to be negligible. (3) 1,000,000 gallons from the Moss Side sewage works, averaging: Dissolved oxygen absorbed 5 days, 9·30 parts per 100,000; 4 hours oxygen absorption 2·29 parts per 100,000.

"None of these produced any result visible to the eye, and the effects were studied in a series of samples taken on the way down the river by a special appliance whereby the samples could be collected beneath the surface of the water in mid-stream. The quality of the river water was found to vary at one point in surprising manner."

As it was not possible to follow one particular batch of water on its way down the river, one individual series of figures was in consequence of little use, and reliable results could only be obtained by averaging a number of series. When the results of the oxygen absorbed were plotted against distance travelled, the effect of the Chorlton Brook on the river water and the gradual recovery of the latter were very apparent, and by extrapolating the recovery curve was deduced that the river regained its former state after traversing four miles. This four miles was covered in about two and a half hours, which meant that according to the dissolved oxygen absorbed test, between four and five million gallons of sewage-derived liquor were oxidised by at most 10 dilutions of river water in two and a half hours. It was to this fact and to the absence of nuisance (except that due to suspended matter) from a river classed in the Royal Commission's scale as "bad" that attention was drawn by the author of the paper.

RE-AERATION OF SEA WATER.

Prof. E. A. Letts and Mr. Charles W. Addy submitted a paper dealing with experiments carried out by them with reference to the factors which come into operation in the aeration of sea-water. Anyone, they said, who has watched the effects of a storm on the sea shore must have noticed the tendency of salt water to foam when strongly agitated. That fresh water did not show the same characteristic was easily demonstrated by shaking two similar bottles, one containing fresh and the other sea water, when it would be found that the air bubbles arising from the former were relatively speaking large and reached the surface almost instantly, whereas those from the second were minute and required a much longer time to ascend. It seemed to the authors that this difference between the behaviour of salt and fresh water might have an important influence on the rate of re-aeration of a sheet of water polluted by sewage, and therefore at

[illegible] sewage.

DISCUSSION

Mr. Mawley said that many of them as municipal officials were able to concentrate their attention to an extent like Mr. Watson and Dr. Fowler on matters of this kind, but they greatly appreciated the frank way in which those gentlemen brought the results of the work before them (see last week's SURVEYOR, p. 139). For instance he might say he had got a vastly better result with tanks one-quarter the dry-weather flow and one contact bed than he had with tanks of twenty-four hours' flow and two contact beds. They obtained better results by getting into an aërobic condition as early as possible. By the quarter dry-weather flow and one contact bed they found they got better results when putting the effluent on old pasture, and they did not foul the grass. He had consequently constructed a scheme of twelve contact beds and a quarter dry-weather flow, and they had been worked for over seven years. They were constantly testing the water capacity, and they found it was 33 per cent of the gross capacity of the bed. It had been a success in every way, and they fell within the standard recommended by the Royal Commission.

Mr. A. E. Collins (Norwich) expressed the hope that something would come of the experiments to which Mr. Watson had alluded.

Mr. W. Kaye Parry (Dublin) said he was working on this subject with Dr. Adeney many years ago, and he would remind engineers present that Mr. Lowcock made some very interesting experiments many years ago in air blowing through his contact beds with very good results. Then for a long time this question rather lay in abeyance, and they were very glad to hear that Dr. Fowler and Mr. Watson had taken the matter up again, for he was certain it was one which deserved more thorough investigation than it had received.

Mr. H. Collins (Norwich) observed that engineers who were concerned in the pumping of sewage might find it better to use air lifts than any other system.

Mr. A. E. Prescott (Eastbourne) said that about two years ago he installed an air lift, and after it was put down they noticed that after the sewage had been lifted and discharged there was a great improvement in it owing to the mixture of air with it. There had been considerably less smell, and the sewage was not so obnoxious, and in every way there had been a great improvement in regard to the quality of the sewage. He thought it bore out the suggestion that a mixture of air with sewage had undoubtedly an important effect upon the quality of the sewage.

Mr. A. J. Martin (London) said this much seemed to be established—that the method of purifying sewage by forced aëration was a technical possibility and a technical success. What remained to be seen was how it compared with other methods from a financial point of view. One point which struck him with regard to the whole of the discussion was that it should be possible to have papers of this kind at this time of day when the question of sewage disposal had been permanently before them for something like twenty-five years. It seemed to be rather a reflection on their reputation as a common-sense people. The only explanation he could find was that this question of sewage disposal was allowed to be stereotyped. The whole question of sewage disposal had been in a more or less stereotyped condition, and they had been content to adopt rule-of-thumb recipes for tanks and filters, and so on. In contrast with the doctrinaire attitude which had prevailed in this country with regard to sewage disposal, he would call attention to the action of a State having a population that exceeds that of the West Riding of Yorkshire, and which for the last thirty years had carried out a remarkable series of experiments on the purification of sewage. He referred, of course, to the Massachusetts State Board of Health. It was a disgrace that in this country, with overcrowding manufacturing districts and overcrowded rivers, a matter of vital importance of this kind should have been allowed to drift without the guidance to be obtained from well-considered, systematic experiments and research in the purification of sewage. He knew that an enormous amount of valuable work had been carried out, but it was in almost every case with the sole object of determining what methods were best adapted for treating a particular sewage in a particular area. They wanted something more than that. They wanted to lay the foundations, and this ought to close, well-directed, exactly work, to ascertain the particulars which underlay the whole system of treatment. At Exeter a year ago he advocated that the Government should take this matter systematically in hand, and that they should have a research department to carry on, at the expense of the country, the work which had hitherto been done in a more or less piecemeal fashion by corporations like Manchester, Leeds and Leicester. He hoped as the result of the new light which had been thrown on an old question by the work of Dr. Fowler and Mr. Watson and other gentlemen, they would realise that the last word had not been said with regard to the purification of sewage, and they would not make up their minds that salvation lay in one particular direction only. He trusted that the work which had been carried on by individual municipalities would be pursued on a far larger scale, and in far greater detail, by the Royal Commission on Sewage Disposal or some department of the Local Government Board formed to carry it on.

Mr. J. S. Brodie (Blackpool) said he had to deal with a sewer which was used both as an outfall sewer and as a tank for storing the sewage between the tides, and he had had very considerable difficulty in keeping this 600 yds. of 6-ft. sewer from being a nuisance. He put up various 16 ft. diameter ventilating shafts, but they were not as good as he had hoped they would be, and as a last resort he put down a fairly large electrically-driven fan and blew pure air into the sewer, by that means obtaining the very happiest results. He had had no further trouble in getting the conditions of the sewer in a fairly innocuous state. When Mr. Watson opened his address he thought he had in his blundering way forestalled him. (Laughter.) Anyhow, that little experiment of pushing fresh air into the sewer, instead of drawing foul air out, was the means of curing an offensive smell.

Mr. Watson said they should be extremely careful not to let the public run away with the idea that there was going to be another revolution in sewage treatment. They were all very sanguine twenty or more years ago when the septic tank advocates suggested that sludge could be got rid of very easily and cheaply. As a matter of fact they were pioneers, but in course of time they found that the sludge was not so easily got rid of. He would like to say how much he appreciated the paper of Dr. Letts. They were tremendously indebted to Dr. Letts for the great work he had done, and his further contribution to the subject deserved their heartiest thanks.

Dr. Fowler said that Dr. Letts had emphasised the difference in the behaviour between sea water and river water, and to any of those present who had to discharge their sewage into the sea it was a point which should be very carefully considered. The discharge into sea water was totally different in many ways from a discharge into fresh water, owing to chemical and biological differences. He had occasion some time ago to study the discharge of sewage on the ebb tide near Harwich, and he found then that the changes which went on were considerably different in sea water from what they would expect in fresh water. It only emphasised the fact which, in his view, could not be too strongly emphasised, that a really successful solution of the sewage problem had not yet been obtained. With unpleasant sludge on the one hand, and unpleasant stinks from filtration, no one could say that the difficulty was solved. They were doing better, but they had not solved the problem. In order to solve it, it was necessary they should have the patience to go step by step into the apparently minute details of a scientific character. That rather brought him to the point he wished to ask about this aëration question, which interested them all. Mr. Watson had brought forward some interesting experiments, and he was glad he was going into the engineering side of the matter, as it was a side which wanted to be very carefully considered just now. But mere blowing of air into sewage was of very little use *per se*. They knew that many had blown air into sewage in various ways with somewhat disappointing results. He ventured to say the reason for that was just the lack of knowing the essential conditions for bringing about a change. They might blow air through domestic sewage and nothing would occur at all, but if they knew the right conditions for blowing, then in two hours they could convert the worst sewage into an effluent better than they could get with a complete double contact system. That was if they knew

[illegible] (Laughter.) That was what they were called upon to do in Manchester. He might say that the work in Manchester, which he explained at Exeter last year, had gone much further during the year [illegible] and every expectation of being able to attract a very considerable amount of the [illegible] of sewage. They need not be afraid that anything very extraordinary was going to happen in the [illegible] of stopping the works, because the advantage of this method was that they could carry it out to the extent they liked. They could spend as much or as little money as they liked. It might be a [illegible] thing to be able to carry about anything in sewage, but he did not certain that if the same amount of money was spent in the scientific application of air—let there be bowling in any direction—and chemical treatment the result could be better worth the money.

(To be continued.)

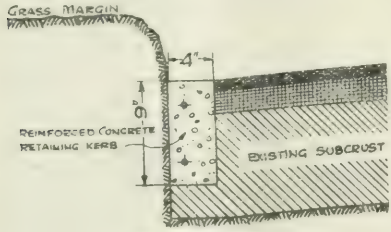
LATERAL SUPPORT FOR ROAD CRUSTS.

By A. Dryland, M.Inst.C.E.,
County Surveyor of Surrey.

In the South and East of England, where hard rocks do not obtain, almost all the road crusts, except those which have been constructed in new streets in towns, are composed entirely of compacted road metal, chiefly gravel or flints, with no supporting substratum of pitching between the road crust and the natural subsoil. Our friends in the North and West, where either hard rock or slag has been plentiful and cheap, are more fortunate, and would not dream of constructing a road to carry any considerable traffic without such a bed at least 6 in. thick, and generally much thicker, of solidly compacted pitching. The same practice has been followed wherever local rock has been available, and the author does not for a moment dispute its desirability, as he well knows its beneficial effect; but there are some thousands of miles of main and district roads in the portions of England first mentioned which have carried fairly heavy traffic in the past, and will have still heavier traffic to carry in the future, without any supporting pitching.

Cross Section of Roadway.

Many surveyors have been heard to suggest that all our roads will, in the near future, require to be re-



Detail of Kerb.

constructed with a pitched foundation. This would be an enormously expensive operation—in fact, in many places where ballast is plentiful it would be cheaper to put in a concrete foundation; but having had pretty good opportunities of studying this question on all sorts of road and subsoils, with a varied range of traffic, the author takes leave to doubt whether any such expensive necessity will arise, as he thinks the requirements can be met in a far less expensive manner, in most cases, where there is at present a good crust composed of well-compacted metal.

On most of our older roads, where gravel, flints and some local sandstone rocks have been used for many years, the crusts are extremely well compacted by the traffic of several generations, and if well drained, and surface water is excluded, need nearly as much [illegible] up as if they were composed of a concrete. The weak point in these roads is, the author thinks, at the sides, as the material, being small, requires lateral support, and the method of strengthening he is adopting is to form submerged continuous reinforced-concrete retaining kerbs to prevent lateral movement of the crust. Prior to the quantity and weight of the traffic in the past, it was confined largely to the centre of the road, and until the steam roller came in almost no repairs were executed in outlying parts.

Steam rolling has been in common use for a [illegible] past, now in full [illegible] in England, and a great deal has been done towards strengthening the sides; but generally there is considerably less strength there than at the centre, and the soil lateral support to crushed road metal is the soil of the adjacent bank, margin or grass [illegible]. If a continuous [illegible] can be inserted between the metal and the margin to confine the road crust and to take the lateral thrust, it will, it is believed, add immensely to the [illegible] power of the road to sustain the traffic, and, what is also of great importance, provide an abutment to the bituminous crusts which are now being constructed.

Some sketches are given to illustrate the suggestions. The author thinks that, as a general rule, on good subsoils with a sound road crust a depth of 9 in. will be sufficient, and a thickness of 4 in. of 6 to 1 concrete composed of fine, clean ballast, with a couple of small reinforcing rods to give continuity. For this purpose the author has hitherto used, as a readily available expedient, a couple of strands of barbed wire. Preference might be given by some surveyors to the use of a thicker and deeper kerb, omitting the reinforcement, but it is thought the reinforcement serves a useful purpose in giving a tensional strength. On roads where heavy motor traffic is becoming common there is a tendency of the heavy vehicles to keep fairly close to the near side to avoid being constantly troubled to pull out to allow faster traffic to pass, and it is this tendency of the passage of heavy vehicles, and the resulting distortion of bituminous crusts which almost invariably begins at the sides, which has impressed upon the author the necessity of side support.

With regard to cost, the author considers that where good, clean, fine ballast can be obtained at a reasonable price the cost of a 9-in. by 4-in. reinforced kerb should not exceed 1s. 6d., or at any rate 1s. 9d., per yard run of side. On a road 8 yds. wide this works out at, say, 5d. per yard super. of road surface, and the suggestion made is that, at any rate where 4s. or 5s. per super. yard is going to be spent on a bituminous surface, the extra 5d. to obtain lateral support is well worth expending.

The author does not for a moment claim any novelty for the idea of lateral support, which he believes is as old as the days of the Romans; but he does suggest that circumstances of traffic have arisen which make it desirable to devote more attention to the subject than has been given in the recent past.

Motor Fire Engine for Gravesend.—The Gravesend Fire Brigade has just received delivery of a new motor fire engine of the very latest type. This machine is of the Merryweather "Hatfield" design, is capable of delivering 350 gallons per minute, and carries a 50-ft. fire escape as well as a 30-gallon tank which supplies water for a "first-aid" jet.

British Fire Prevention Committee.—The British Fire Prevention Committee concluded its summer session last week with a series of tests relating to wired glazing, both in the form of skylights and casements (submitted by Messrs. Pilkingtons, of St. Helens), for classification under the committee's standards. The skylight test was an hour test; three of the window openings that had been glazed were submitted to a one-hour test, and another three to a 1½-hour test, the temperatures in each case ranging from 1,500 deg. to 1,650 deg. Fahr., and the fire test being immediately followed by the application of water from the steam fire engine. The reports of these tests will be issued in due course. Having regard to the number of applications for interesting tests with fire-resisting materials and systems of construction, the committee have decided this year to have a vacation session, and there will thus be tests during August and September. These will include a series of sprinkler tests, a series of tests as to the application of gases to the extinguishing of fire in ship holds, and a series of extinguisher tests, while the autumn session will include a number of tests with constructional work.

ASSOCIATION OF SOMERSET SURVEYORS.

MEETING AT WILLITON.

Mr. W. A. Collins, surveyor to the Bridgwater Rural District Council, the president, occupied the chair at a meeting of the Association of Somerset Surveyors held at Williton on the 15th inst., there being also present: Messrs. E. Stead (Somerset County), D. Edwards (hon. secretary, Taunton), R. Stephens (Chard Rural), C. Durie (Williton Rural), J. Johnson (Keynsham Rural), E. G. Crump (Taunton Rural), L. Caplen (Yeovil Rural), E. W. Hearn (Chard), J. R. Lamacraft (Williton Rural), R. Nicholls (Wells), R. E. Jackman (Williton Rural), John Lovell (Axbridge Rural) and J. J. S. Hayman and E. A. Wadmore (Bridgwater Rural), A. F. Luttrell (chairman of the Williton Rural District Council), F. Risden (clerk to the Williton Rural District Council) and W. Brownscombe (a member of the Williton Rural District Council).

In welcoming the members, Mr. A. F. Luttrell, chairman of the Williton Rural District Council, said it was recognised to-day that the surveyor must be a man who must be trained on highly skilled and scientific lines. In bygone times the surveyor often used to keep half an eye on the roads, a quarter of an eye on sanitary matters, and a quarter of an eye on something else; but now he was a whole-time officer, and a highly trained man.

The president then took the chair, and announced that Mr. C. Durie, highway surveyor to the rural district council, had prepared two papers for discussion, the first of which related to

HIGHWAY ADMINISTRATION IN WILLITON RURAL DISTRICT.

Mr. Durie stated that the area of the whole district was 99,511 acres, and the mileage of roads was: Main roads, nearly 71½ miles; district roads, 290 miles. The eastern portion of the district comprised 38¾ miles of main roads and 142 miles of district roads, in addition to which there were 4½ miles of church footpaths maintained. For road surfacing and repairs an excellent quality of old Devonian sandstone, fine grained and tough, was obtained from the western side and the north point of the Quantock Hills, some of which he hoped to see used as tar-macadam in the near future. In July, 1911, the Williton Council commenced the system of direct labour. With the beginning of the new financial year following, this system was extended to a few miles of main and district roads, and the working of the council's most important quarry, Bickholler, was included. In 1913-14 the area was extended, the year commencing with 23½ miles of main roads and 63¾ miles of district roads being placed under the direct-labour system. The principle was also applied to the more important main roads in the western division. A further extension had since been made in his division, there being now left under the contract system only two miles of main roads and 54¾ miles of district roads. The policy of making the change and developing the system on gradual lines had been a wise one, and accounted, in a large measure, for its successful working. He had been able to arrange the working areas so that each gang had a quarry to fall back upon, where useful work was always wanting to be done. The getting and sorting of stone from eight quarries in the division was done by direct labour. All wages, cost of tools, and tool repairs, quarrying requisites, sheds and expenses, including fencing, in carrying out the work, were charged to the quarry account, while the returns to the quarry account were based on the prices at which the contractor was paid at the time the quarry was taken over, prices ranging from 6d. to 9d. per yard for gravel and stone.

In his second paper Mr. Durie dealt with the Highway Act Amendment Act of 1885. So far as he knew, he did not think this Act was generally taken advantage of by other road authorities, particularly as regarded the topping of roadside hedges. The Williton Council undertook to do this work with a view to keeping the hedges down and obtaining a dry and healthy road, as well as in order to have uniform fences. The manual labour for what he termed hedging and ditching on district roads did not come to £4 a mile, which undoubtedly was very cheap, and in considering why this should be so he had come to the conclusion that the road being kept dry and healthy by low hedges not only undoubtedly made it last longer, but also saved manual labour in regard to scraping and cleaning.

The President, in proposing a vote of thanks to Mr. Durie, congratulated the Williton Rural District Council upon introducing the system of direct labour, adding that he was sure the time was not far distant when the council would see by the results that it was well worth doing, and the system would be extended throughout the whole district. The Act of 1885 had been taken advantage of in the Bridgwater district. The hedges were sheared, but they were not topped to the extent they were in the Williton district, except at corners where the view was obscured. He found that by approaching occupiers and owners they could generally be got to lower the hedges where it was required; but in all cases the council cut the sides of the hedges and cleared the stuff away.

Mr. T. G. Crump (Taunton Rural), seconding the vote of thanks, observed that the general public and the owners and occupiers were beginning to wake up to the fact that if hedges were kept low it meant a better and a cheaper road.

Mr. R. Stephens (Chard Rural) expressed the view that if the old Highway Act were properly carried out every occupier would be made to keep down his hedges adjoining the road.

Mr. E. Stead (Somerset County) agreed that a road could be kept in much better condition and more economically if the hedges were cut down to a reasonable height. His belief was that a great deal more could be done by moral suasion than by the aid of the law. The stone which Mr. Durie had spoken of was one of fair quality, but it was not going to be satisfactory for a great number of years, and he hoped that Mr. Durie would not use too much of it as tar-macadam. Tar-macadam was not going to be the end of the road question, and it would have to be very carefully and scientifically used if the results were going to be anything like satisfactory. It was no use to make tar-macadam with weak stone, because it had not the resistance to crushing. The county council were laying down a tar-macadam portable plant near Long Ashton, and they were going to try what could be done with the Somersetshire limestone. He believed that the best Mendip stone would be found to have greater resistance to crushing than any of Mr. Durie's stone, and he should not advise him to use too much tar-macadam until he saw the result of the county council's experiments with the better class of stone.

Mr. J. Johnson (Keynsham Rural) said he could not understand any present-day surveyor advocating the contract system. It was just as reasonable to think that surveyors could make good surfaces with inferior material as that they could make roads with unskilled part-time contractors.

Mr. D. Edwards (Taunton), referring to a remark that the cost of hedge cutting should not be borne by the local authority, said he was not of that opinion, because it was the local authority who benefited by the road being properly looked after. There was no question, in his mind, as to the value of direct labour on roads. A road contractor, generally speaking, was half a road man and half a farmer, and he was bound to make money out of his contract. Naturally, he chose the easiest spot to get stone from the quarries, but this had a very detrimental effect on the roads.

Mr. Durie, in replying, said the stumping of hedges was always avoided when possible. He thought the stone to which he had referred would be equal to the best-quality limestone in the county. He had a length on the Bridgwater road, made in 1906, which was frayed a little, but it had been there for eight years and was still very good.

WORKMEN'S DWELLINGS.

Mr. R. E. Jackman, sanitary surveyor to the Williton Rural District Council, afterwards addressed the meeting on the housing scheme which the local authority is proposing to carry out. Mr. Jackman said it was hoped that the scheme, inclusive of land, would not involve a cost of more than £200 per house.

Acock's Green Sewage Disposal Scheme.—The Birmingham, Tame and Rea District Drainage Board on Wednesday adopted a scheme of sewage disposal for the Acock's Green district, the estimated cost of which is £61,560.

Proposed Extension of Newcastle Tramways.—The Select Committee of the House of Lords on Wednesday ordered for third reading the Bill promoted by the Corporation of Newcastle-upon-Tyne for the provision of additional tramways in the urban districts of Longbenton and Westslade.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M.INST.C.E.

All communications in regard to this page must be addressed to the Editor, St. Peter's House, 23 Bridgeland Street, [illegible] questions must be written [illegible] to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

[illegible] are invited to the following [illegible]

410. Removal of Sand Bar.—A certain stream [illegible] has become silted up, [illegible] by the formation of a [illegible] 10 yds. by 3 yds. What steps [illegible] to remove a nuisance, and to insure that the stream will be self-cleansing by the action [illegible] (Student.)

411. Foundations for Chimney Shaft.—What calculations are necessary for finding the width and [illegible] foundation of a square furnace chimney shaft, 150 ft. in height, on a gravel soil, and built in accordance with the London Building Act, 1894? (Student.)

412. Marine Surveying.—Describe a method for obtaining the direction and velocity of tidal currents.

414. Strength of Materials.—Prove the formulæ $\frac{M}{I} = \frac{f}{y}$ and $\frac{M}{EI} = \frac{1}{r}$ with respect to beams, and explain the meaning of the symbols used.

415. Sewerage.—What conditions generally determine the adoption of either the "separate" or the "combined" system of sewerage in a town? (A.M.I.C.E.)

416. Concrete Floor.—Give two sections of a reinforced concrete floor for a span of 30 ft., showing the sizes and weights of the girders, and giving the necessary calculations. (K. G. F., *Buckfastleigh*.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

407. Surveying.—Describe a method of setting out circular curves by means of offsets. (M. C. E.)

First Method.

Let XX and YY be the two lengths of straight line required to be joined up by the curve. Consider XX to be C Fig. 1, so that XC = 1 chain, for

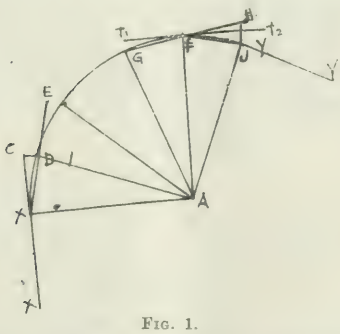


FIG. 1.

convenience to mark the point C. A short wood lath is now used with a notch at either end, the distance between these notches is equal to the second and each succeeding offset to the curve. A notch midway between these two is cut. The distance between the first and middle notch represents the first offset to the curve. With the first notch on C, place the end of the chain on the springing of the curve at X, where the other end of the chain and the middle notch intersect is the first point (D) on the curve. Continue the chord XD to E, DE being equal to another chain, proceed in the same manner, but use now the full offset, or the distance between the extreme notches. Proceed in a similar manner till all the points on the curve are obtained.

Theory of the Method.

First Offset.—In Fig. 1 we will consider the curve between X and Y drawn. XC = XD = 1 chain. XA and DA are radii.

It is a well-known theorem in Euclid that the angle CXD = ½ the angle DAX.

$$\therefore \frac{CD}{XD} = \frac{XD}{2XA} \text{ or } CD = \frac{XD^2}{2XA} \text{ or offset} = \frac{\text{chord}^2}{2 \times \text{radius}}$$

This is the equation for the first offset.

Let G, F, and J be further points on the curve. GF is a chord produced to H. GF = FH = FJ. HJ is the offset determining the position of the point J on the curve. Draw T_1, T_2 tangential to the curve at F.

Now $T_1FG = CXD$ (Fig. 1). A moment's consideration of the angles T_1FG, HFT_2, and T_2FJ will suffice to show that HFJ = 2T_1FG, or 2 × CKD the original angle.

$$\therefore HFJ = FAJ \text{ and } \frac{HJ}{FJ} = \frac{FJ}{JA}$$

$$\text{or } HJ = \frac{FJ^2}{JA} \text{ or offset} = \frac{\text{chord}^2}{\text{radius}}$$

This is the equation for the second and succeeding offsets.

Second Method. Or Method of Ordinates from a Chord.

As before, let XX and YY be the two lengths of straight line required to be joined by the curve. (Fig. 2.)

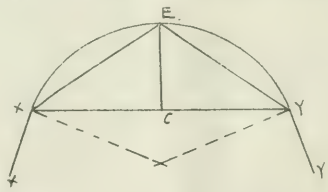


FIG. 2.

Set out the chord XY. The offsets could be set off directly from XY, or, if the offsets are too great, lay out the versed sine CE and set off the chords EX, EY. From these two chords the ordinates can be set off as required.

The versed sine is obtained from the formula

$$V = R - \sqrt{R^2 - (\tfrac{1}{2}c)^2} \quad . \quad . \quad . \quad (1)$$

The ordinates are obtained from the formula

$$O = \sqrt{R^2 - X^2} - (R - V) \quad . \quad . \quad . \quad . \quad (2)$$

where R = radius
C = chord
V = versed sine
O = ordinate
X = the distance of the ordinate from the centre of its chord.

(N. S. J.)

409. Road Construction.—Give a specification for the conversion of a macadam into a granite sett paved road suitable for heavy commercial traffic. ("Urban.")

The roadway to be excavated below the new surface level for an average depth of 13 in. The foundation for paving is to be made with Portland cement concrete, 6 to 1, 6 in. in thickness, and

The Surveyor

And Municipal and County Engineer.

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finished off with the proper head and crossfall. All suitable macadam excavated may, after screening, be utilised as aggregate for the concrete. When the concrete has set it is to be covered with sand, gravel, or clean ashes, 2 in. in thickness. The roadway to be paved with granite setts 4 in. wide and 5 in. deep, from an approved quarry. The setts to be laid square, close and parallel, racked with limestone chippings, and well rammed; after which the joints are to be run with asphalt.

As regards the kind of granite setts to be used, I [illegible] to a large extent be guided by the cost of same delivered to his district. (Nyng.)

413. Applied Mechanics. Sketch and describe a [illegible] and state for what purpose and how [illegible]

The Prony brake is what is known as an absorption dynamometer—*i.e.*, an instrument for measuring the torque exerted by a machine. In this form of dyamometer the work done by the torque is wasted by being converted into heat by means of friction. This instrument is used for testing small high-speed motors, for it will be seen later that it

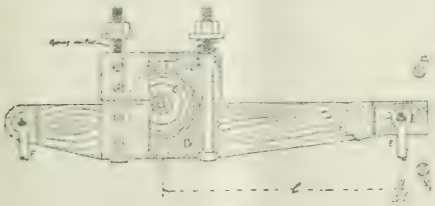


Fig. 1.

is an easy matter to calculate the horse power absorbed by the dynamometer, and this, by the conservation of energy, will be the horse power of the motor under test.

A simple but very successful form of the instrument is shown in Fig. 1 (elevation) and Fig. 2 (plan).

D is the shaft of the motor, keyed to it is the small cast-iron pulley C. A and B are two wood blocks clamped together with bolts and nuts as shown, and the two blocks embrace the pulley. In order to keep the pressure between the blocks and the pulley constant the nuts work against springs which are recessed into the upper block A. The block B is so cast in a form that it forms a two-armed lever with the shaft D (*i.e.*, pulley C) as the fulcrum. The load W on the brake is suspended from the rod E; while a weight is suspended from the rod F which just balances the unloaded brake.

S_1 and S_2 are stops which limit the motion of the lever. The lubrication of the brake is effected by

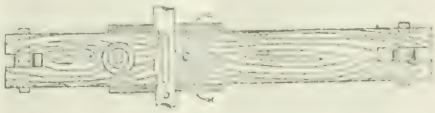


Fig. 2.

means of a stream of soapy water which enters at the top, is distributed over the surface of the pulley by grooves formed in the rubbing surfaces of the blocks, and leaves by the pipe at the bottom, and to prevent the water coming out at the sides wooden shrouds—L and M—are fitted to the sides of the blocks. The chief fault of this brake is that it is liable to violent oscillations, even when the torque is uniform, owing to the variations in the coefficient of friction between the blocks and the pulley. To obviate this defect a dash-pot is

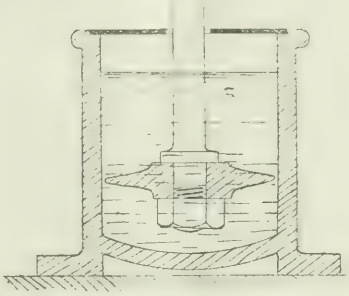


Fig. 3.

arranged, in which a piston fixed to the rod F works. The oscillations are thus damped considerably. Its action is that when the lever oscillates the amplitude of these oscillations are communicated to the piston (which should be thin at its edge, and be about $\frac{1}{16}$ in. smaller in diameter than the bore of the cylinder), but the motion of the piston is retarded by the liquid in the cylinder, a portion of which must move from one side of the piston to the other through the annular space between the piston and the cylinder. As shown, the cylinder is filled with oil or water; and the arrangement of the dash-pot is as shown in Fig. 3 (sectional elevation).

If l is the distance of the axis of the rod E from the axis of the shaft in feet.

W = load on rod in E in lbs. weight.

n = speed of shaft in revolutions per minute.

Then, horse power absorbed by the dynamometer is given by the expression—

$$\frac{\text{Work per minute}}{33{,}000} = \frac{2\pi \cdot W \cdot l \cdot n}{33{,}000}$$

Since all these quantities are known, the horse power is determinate; and it should be noted that neither the diameter of the pulley nor the coefficient of friction between the brake blocks and the pulley are required to be known. (T. W. P., *Bexhill-on-Sea.*)

Business Announcement.—As announced in our last issue, Claridge's Patent Asphalte Company, Limited, have opened an agency in Manchester in order to cope with the work in the North Midlands district. Their representative is Mr. E. J. Thompson, of 36 Spring-gardens, Manchester not Spring Chambers as we were advised in error last week.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain
First, man's opinion freely is his own
Contrary anything, or anybody
— Massinger "The Fatal Dowry," Act iv. 2

THE GUILDFORD SURVEYORSHIP.

To the Editor of The Surveyor.

Sir,—[illegible] with interest the conditions governing this appointment.

Among [illegible] expected to [illegible] of [illegible] and prepare [illegible] Parliament, all plans and [illegible] the council [illegible] to leave the [illegible] and financial or supervision of any employee in his department . . . subject to the in[illegible] in adhering to lines laid down by the council! His duties are to include all architectural work and all others, "notwithstanding that the same [illegible] or implied."

After such a [illegible] the condition that the officer "shall devote the whole of his time to the duties [illegible] and shall not engage in any other business [illegible] either by himself or in conjunction with any other person or person," is entirely superfluous, and the corporation displays [illegible] which it is incapable of appreciating. What time an officer will find for outside practice in the [illegible] I am at a loss to imagine; I doubt if he will have even time for sleep.

That a corporation of the position of Guildford should deliberately set out to purchase a man, body and soul, is an alarming state of things—perhaps also a sign of the times. But it opens up a wider question than the mere self-respect of municipal surveyors which is attacked under these terms. There is the position of the consulting engineer and the profession of architecture to be considered. What chance will those men have of retaining their practice if borough engineers are to be expected to perform what is essentially specialists' work? It is neither just nor proper.

The advertisement states, too, that the candidate must be a member, or associate member, by examination of the Institution of Civil Engineers. Is that a measure of his ability to perform architectural work? Are there not other professional institutions more fitted to certify the abilities of municipal surveyors for their particular calling? What about the Surveyors' Institution, or the Institution of Municipal and County Engineers—a body whose diploma is regarded generally as being an indispensable qualification in the profession. Such a condition will not [illegible], and exclude a number of excellent men, and the corporation will be well advised to amend the stipulation to accept an equivalent [illegible]. Yours, &c.,

Hydrant.

PUBLIC SWIMMING BATH WATER: CONTINUOUS AERATION AND FILTRATION.

To the Editor of The Surveyor.

Sir,—My attention has been called to Mr. Lewis's criticism on my comments with reference to his paper read before the Institution of Water Engineers at their recent summer meeting, and which appeared in your issue of the 17th inst. In view of the widespread interest in this subject, and the possibility of [illegible] I venture to hope you will kindly publish these few further remarks thereon.

One might conclude from Mr. Lewis' criticism that I advocated dispensing entirely with aeration. This is not so, for I distinctly said that aeration was [illegible] part of the treatment, but I wished to emphasise the fact that chemical treatment was equally as important. My opinion has in this respect been very much strengthened by that of several medical experts, who have recently investigated this subject, and as a result strongly advocate chemical treatment and sterilisation of the water in addition to aeration and filtration, in order to obtain the best results. As to Mr. Lewis' remarks regarding the fatty impurities in the water coagulated by chemical treatment being a disadvantage, I am afraid I must disagree with him, as I look upon it as a decided advantage, and very necessary. It is the most efficient way to treat such impurities in order to be able to filter them out of the water, and if Mr. Lewis' experience is that coagulation takes place in the swimming pool [illegible] it must be due to improper treatment. Am I right?

I also [illegible] that Mr. Lewis [illegible] that chemical treatment involves the expenditure of [illegible] experience [illegible] opposite. The chemical treatment [illegible] the impurities [illegible] out of the filter bed. As to cost, the chemicals used in the Turnover Filter Co.'s process only cost a few pounds per annum, a practically negligible amount.

I do not [illegible] that they [illegible] chemical treatment with their filters, but that Mr. Bertram Brameld was the first [illegible] in connection with the continuous purification of swimming bath water, and that the "Turnover" filter is specially adaptable for use with such a system owing to the very efficient cleansing of the bed which is ensured by its use.—Yours, &c.,

Robt. A. Blakeborough.

Brighouse,
July 27, 1914.

IMPROVEMENT OF SEWAGE FARM LAND.

To the Editor of The Surveyor.

Sir,—In your last issue Mr. G. Bertram Hartree, the surveyor of Alton, Hants, referred to the statement made in "Things One Would Like to Know" as to the improvement of heavy soils in sewage farms by the addition of house refuse, and gave his experience, which corroborated my statement.

There can be no doubt that the addition of house refuse to a heavy soil containing a large quantity of hydrant silicates of alumina is affected chemically by the alkalis and carbons contained in the house refuse, and there is, in addition, the more important "mechanical" factor of tending to dry the soil and to break it up and render it lighter and more porous. The decomposition of the vegetable organic matter in the refuse seems also to have a very beneficial effect on a heavy soil.

The whole question is of great interest, and is worthy of experimental study by agricultural chemists.—Yours, &c.,

Your Contributor.

July 27, 1914.

ROAD BOARD RETURNS.

To the Editor of The Surveyor.

Sir,—I am a surveyor to a large but poor rural district council. These Road Board red herrings are causing me an enormous amount of extra labour and scheduling. I am not a philanthropist, but would willingly subscribe towards the printing if the Road Board would be humane enough to include in their exhaustive instructions that it is legal to remunerate surveyors for this extra work.

Take my poor council! They won't get a stiver! But they have just a faint hope; and I have to give up my half-day holiday *(pro tem.)* in consequence. I hate criticising, but feel a bit sore about it, so thought you might have another reader who would either agree with me or tell me off. I have always admired Mr. Maybury immensely, and feel sure he will remember us. I hope he will see this.—Yours, &c.,

Toad Under a Harrow de Luxe.

July 22, 1914.

ROAD TERMINOLOGY.

To the Editor of The Surveyor.

Sir,—As "Not so Dusty" has not seen his way to deposit the £25 in your hands, I have therefore laid certain information before you to show that I have "had 30 years' personal experience in refining bitumen for road paving" and that I "have anything else but a very limited knowledge of the manipulation of natural bitumen for road work outside the laboratory."

Further evidence, if necessary, is at your disposal, and I have taken this step to put an end to a personal discussion which has unfortunately drifted somewhat beyond the limits of "Road Terminology."—Yours, &c.,

Engineer.

July 27, 1914.

[We have only to add that the documents submitted to us make it perfectly clear that our correspondent has not put forward exaggerated claims in regard to his experience in the work to which he refers.—Ed. Surveyor.]

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Ammanford and Llandilo R.D.C.s (July 11th. Mr. P. M. Chattaway).—£1,500 for the construction of a substitutive bridge at Rhydcymerau, near Pantyffynon Station.—The work of the bridge at that point has been usually left to the local population. The estimated cost is £3,500.

Brierley Hill U.D.C. (July 16th. Major J. Stewart).—£6,000 for the purchase of Brierley estate.—The chairman of the Sanitary Committee, Mr. G. F. Jones, stated that the council had entered into a provisional agreement with Mr. W. H. Foster, of Birmingham, for a portion of the estate, consisting of 38 acres. Of this only 12 acres were considered suitable for burial purposes, and a considerable portion of the land might well be used for building workmen's houses, but at present there was no great demand. All the available burial land in the district was already used up. Dr. Jones and the town clerk, Mr. J. L. Harper, also gave evidence in support of the application.

Brixham U.D.C. (July 28th. Mr. H. A. Chapman).—£850 for the purchase of land and the erection of working-class dwellings.—It was stated that the site would provide accommodation for 42 houses with gardens at the rear, but the council only proposed to erect 16 at present. The houses would be erected in two blocks of six and one block of four, leaving frontages of 17 ft. each. Their accommodation would consist of three bedrooms, living room, scullery, and the usual offices. The estimated cost of each dwelling was £210, and it was calculated, if the houses let at 5s. per week, the council paying rates and taxes, that they would be self-supporting.

Chester T.C. (July 22nd. Mr. Edgar Dudley).—£2,910 for the purchase of property for the widening of Frodsham-street.—The street, it was stated, was one of the most important thoroughfares in the town, and already £12,000 had been spent on improving it. The property the council now proposed to purchase would enable them to complete the whole scheme and widen the road at the south end from 25 ft. 10 in. to 38 ft. 10 in., and the north end from 23 ft. to 30 ft. 4 in.

Evesham R.D.C. (July 15th. Mr. A. G. Drury).—£3,000 for a scheme for Harvington, near Evesham, under Part III. of the Housing of the Working Classes Act, 1890.—The clerk, Mr. E. H. Wadams, asked that the money for the purchase of the land (£750) should be repayable in eighty years, and that spent on the building (£2,650) in fifty years.

Guiseley U.D.C. (July 14th. Mr. A. W. Brightmore).—£3,700 for works of sewage disposal and surface water drainage. Mr. J. N. Nicholson, Assoc.M. Inst.C.E., Bradford, the engineer, explained the details of the scheme. There was no opposition, and Dr. Wilson, chief inspector of the West Riding Rivers Board, stated that, in his opinion, the scheme was a very good one.

Wallasey T.C. (July 23rd. Mr. F. H. Tulloch).—£1,570 for the widening of the north-east side of Breckroad; £2,075 for the widening of Claremont-road, south of Mayfield-road; and £997 for the provision of an 18 ft. public footpath from Warren-drive to Searoad.—The borough engineer and surveyor, Mr. W. H. Travers, explained the proposed works in detail.

APPLICATIONS FOR LOANS.

Barnet R.D.C.—£6,000 for the provision of workmen's dwellings.

Brighton T.C.—£5,350 for educational buildings.

Chester T.C.—£435 for street widening.

Doncaster R.D.C.—£3,550 for a water supply for Adwick-le-Street, and £2,300 for a supply for Askern.

Evesham R.D.C.—£2,500 for a water supply scheme.

Falmouth T.C.—£1,625 for paving, kerbing, and channelling works.

Hoylake U.D.C.—£900 for road widening.

Limerick T.C.—£25,000 for paving works with stone setts.

Shipley U.D.C.—£82,000 for workmen's dwellings.

Southend T.C.—£3,340 for gas retorts and buildings at Leigh, and £1,100 for underground conveniences.

LOANS SANCTIONED.

Brighton T.C.—£13,200 for the provision of a playing field.

Belfast T.C.—£1,130 for the Upper Falls sewage disposal scheme.

Bromley R.D.C.—£5,[illegible] for the West Wickham sewerage scheme.

Caerphilly U.D.C.—£[illegible] for road works.

Cork T.C.—£2,2[illegible] for machinery at the waterworks.

Evesham T.C.—£1,500 (to be repaid in eighty years) for the purchase of land for the erection of workmen's dwellings.

Hendon U.D.C.—£[illegible] for extensions to the sewage outfall.

Hoylake U.D.C.—£2,500 for laying out a recreation ground.

Islington B.C.—£5,316 for additional cooling towers at the electricity works.

Keith T.C.—£800 for the construction of a reservoir.

Llandudno U.D.C.—£13,000 for the provision of golf links.

Melton Mowbray U.D.C.—£700 for cemetery extension.

Radstock U.D.C.—£151 supplemental loan for the erection of forty houses.

Rotherham R.D.C.—£[illegible] for works of sewerage.

Shildon U.D.C.—£550 for the extension of the recreation ground.

Tewkesbury T.C.—£2,500 for a housing scheme.

Woolwich B.C.—£20,295 for works of paving.

FORTHCOMING INQUIRIES.

AUGUST.	£
1.—**Beckenham.** For works of sewage disposal (Mr. R. B. Hetherington) .. .	37,225
1. **Bentley.** For the erection of workmen's dwellings (Mr. H. S. Stewart) ..	26,017
1.—**Carlisle.** For works of sewerage (Mr. A. G. Drury)	1,200
1. **Sutton-in-Ashfield.** For works of water supply (Mr. H. Shelford Bidwell) ...	8,600
5. **Aldenham.** For works of sewage disposal (Mr. R. G. Hetherington) .. .	11,000
5.—**Barnoldswick.** For private street improvement (Mr. F. H. Tulloch)	
5.—**Birmingham.** For paving, improvement and sewerage works (Mr. A. W. Brightmore) . . .	47,150
5.—**Bowland.** For works of sewage disposal (Mr. A. G. Drury)	2,180
5. **Caerphilly.** For laying out a recreation ground (Mr. M. K. North)	2,859
5.—**Dewsbury.** For street improvement and the provision of pleasure grounds (Mr. Edgar Dudley) .	3,600
5.- **Paignton.** For hospital extension (Mr. J. P. Candler)	2,537
5.—**Sheffield.** For improvement, street and cemetery purposes (Mr. H. Shelford Bidwell) . .	19,600
5.—**Upholland.** For the provision of workmen's dwellings (Mr. H. S. Stewart) ...	1,500
6. **Kirkby-in-Ashfield.** For the provision of a gasholder (Mr. H. Shelford Bidwell)	4,000
6. **Mytholmroyd.** For works of water supply (Mr. F. H. Tulloch)	1,000
6. **Panteg.** For the provision of a public bath (Mr. M. K. North)	900
6. **Prescot.** For the provision of workmen's dwellings (Mr. H. S. Stewart)	1,300
6.—**Rotherham.** For street improvement and the provision of a cattle market (Mr. Edgar Dudley)	16,230
7.—**Mansfield.** For the purpose of street widening (Mr. Edgar Dudley) . .	2,850
7.—**Newport (Mon.).** For county offices extension (Mr. M. K. North) .	2,300
7.—**Pontefract.** For burial ground extension (Mr. F. H. Tulloch) ..	1,300
7.—**Stotfold.** For the provision of a recreation ground (Mr. H. Shelford Bidwell) . .	300

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

[illegible] Buildings, Birmingham, Brighton, Preston, £20,000; housing and town planning, Hull, £107,270; New [illegible] Leicester, [illegible] £3,750; Fulham, £22,000; St. Albans, water, gas and electricity; Margate, Newport, £120,000. Particulars of other works projected may be found on pp. [illegible] Local Government Board Inquiries, pages [illegible].

BUILDINGS.

Birmingham T.C.—A scheme has been adopted for the extension of the law courts and police offices, at an estimated cost of £23,925. Alterations are to be effected at the Northwood-street baths, at an estimated cost of £1,132.

Brighton T.C.—The Special Aquarium Committee recommend that, in connection with the competition for designs for carrying out the proposed alterations and improvements to the Aquarium, a sum of 175 guineas be offered in premiums, and further that they should be authorised to appoint a professional assessor to advise as to the relative merits of the designs received at a fee not exceeding 50 guineas. The Finance Committee, having regard to the council's decision to invite competitive designs, recommend that the necessary addition to the estimate be sanctioned.

Denbigh T.C.—The tender of Messrs. Moreton & Browne, of Chester, at £8,955, has been accepted for the erection of a new town hall and market buildings, including clearing away the existing old buildings. The architects are Messrs. Brock, Elcock & Co., of Manchester.

Edinburgh T.C.—The Plans and Works Committee recommend the acceptance of an estimate, at £3,000, for the erection of wash-houses in McLeod-street.

Finsbury B.C.—The tender of Mr. W. Reason, at £1,279, has been accepted for alterations at the town hall.

Ilkeston T.C.—The Health Committee have received authority to prepare a scheme for the provision of a public swimming and washing baths.

Leicester T.C.—It was announced on Tuesday last that the Local Government Board had approved the scheme for a new tuberculosis sanatorium upon land adjoining the isolation hospital. The amount involved was £6,747 for buildings, and £3,000 for other works, and the work would be proceeded with at once.

Preston T.C.—It is proposed to build public baths in Saul-street, at an estimated cost of £20,000.

Southall-Norwood U.D.C.—The surveyor, Mr. Reginald Brown, has submitted various suggestions with regard to laying out the Manor House grounds, and last week it was agreed to adopt his proposition as to reserving certain parts of the estate for *al fresco* concerts to be held on Saturday evenings, the surveyor being instructed to make the necessary arrangements.

Ventnor U.D.C.—It has been decided to spend a further sum of £200 upon the improvement of the public conveniences.

Warwickshire C.C.—The Roads and Bridges Committee, it is understood, have decided to proceed with the reconstruction of a dangerous canal bridge on the main road between Bedworth and Bulkington.

West Sussex C.C.—The council have adopted the recommendation of the Finance Committee to establish the new county offices at Chichester.

Wrexham T.C.—The borough surveyor, Mr. J. England, has been directed to prepare a site plan of the proposed new town hall scheme.

HOUSING AND TOWN PLANNING.

Bowland R.D.C.—The surveyor, Mr. A. Burrow, has prepared plan and specification of cottages which it is proposed to erect at Gisburn, at an estimated cost of £1,400.

Bristol T.C.—The Health Committee have adopted a scheme for the provision of working-class dwellings. The report submitted stated that a suitable site would cost £6,800, the construction of roads and sewers £3,750, that the estimated cost of the proposed houses ranged from £175 per house to £218 per house, and that the total capital expenditure at Parson-street would be £28,544, and at Stapleton-road £20,510.

Hamilton T.C.—Workmen's dwellings are to be erected at an estimated cost of £3,200.

Hull T.C.—The Health Committee have sanctioned a scheme for the erection of 252 working-class dwellings in the New George-street area, at an estimated cost of £107,270.

Leicester T.C.—The Estates Committee have been authorised to prepare a scheme for the provision of workmen's houses.

Newcastle-on-Tyne T.C.—The council last week adopted the report of the Housing Committee recommending the erection of workmen's dwellings. It is proposed to erect at St. Lawrence 112 dwellings, consisting of eighty-four two-roomed dwellings, and twenty-eight three-roomed dwellings, and on land belonging to the corporation it was proposed to erect a further set of sixteen dwellings, consisting of eight two-roomed dwellings and eight three-roomed dwellings.

Southall-Norwood U.D.C.—With regard to the housing scheme alluded to last week, the council have agreed to the erection of twelve houses in Norwood-road and forty-two houses in Western-road, the work to be carried out by the surveyor, Mr. Reginald Brown, by direct labour.

PARKS AND OPEN SPACES.

Birmingham T.C.—The extension of Selly Park, at a cost of £1,800, has been approved.

West Bromwich T.C.—The Baths and Parks Committee recommend the council to purchase the land forming the entrance to Dartmouth Park, at present held on lease, for the sum of £650.

Wrexham T.C.—The borough surveyor, Mr. J. England, has received instructions to prepare a specification and invite tenders for the laying out of six tennis courts in the park, two of which are to be of asphalt.

ROADS AND MATERIALS.

Chesterfield T.C.—Following his gift of a public swimming bath, Alderman Markham has undertaken to construct a new road from Cemetery-hill, at the side of Wharton's foundry, across to Piccadilly, joining the new road towards Tapton, now being constructed by the Midland Railway Company. The Alderman will give the land for the road, metal it to 25 ft., leaving sufficient space for a 45-ft. road, and lay down the sewer. The council have accepted the gift with thanks.—It has been decided to make up Grove-street and Penmore-street, South Ward, and the borough surveyor, Mr. Vincent Smith, has been instructed to prepare plans for executing private street works in Tennyson-avenue.

Eastbourne R.D.C.—The Highways Committee report that they have received an estimate prepared by the district surveyor, in conjunction with the borough surveyor of Bexhill, Mr. G. Ball, of the probable cost of the proposed coast road. The total length in the rural district and in the borough of Bexhill would be 2 miles 920 yds. The total cost was estimated at £64,566, exclusive of the purchase of land and wayleaves, but the adoption of the shorter route would reduce the cost by £2,500. The committee passed a cordial vote of thanks to Mr. G. Ball and his assistants for the very valuable help they had rendered in the matter.

Inverness-shire C.C.—The Lochaber District Committee have agreed to accept an offer by the Road Board by which the board are to give £3,600 immediately, and £960 on loan without interest, to be paid in four annual instalments, on condition that the district council spend a total of £4,800 on the improvement of the Ballachulish road, and one or more outlying roads in the district.

Wandsworth B.C.—Having considered the question of providing more street refuges in different parts of

the borough, and obtained a report from the borough engineer. Mr. P. Dodd, on the subject. The Highways Committee recommended, and the council agreed, that temporary refuges be provided in certain places, with a view to permanent refuges being constructed there if the sites selected are found satisfactory.

Coventry T.C.—The council on Tuesday agreed to the scheme for the construction of new streets, and the improvement of narrow thoroughfares in the centre of the city, at an estimated cost of £[illegible]. The necessary powers will have to be obtained.

East Sussex C.C.—The council have accepted a tender, at £32,074, for the improvement of the road from Lewes to Newhaven. Towards this expenditure the Road Board have sanctioned a grant of £17,[illegible].

Hammersmith B.C.—The necessary loans having been sanctioned, it is proposed to expend £6,045 upon concrete foundations, and £[illegible],062 upon creosoted wood paving work.

Kingswood U.D.C.—It has been agreed to purchase from Messrs. Llewellins & James, Bristol, a 250 gallon tar spraying machine, at £[illegible] 10s.

Lambeth B.C.—It has been agreed to carry out the following paving works: Lambeth Palace-road and Stangate, £4,487; South Lambeth-road, £8,275; Brixton-road (from Stockwell-road to Kennington Park-road), £13,282.—A petition has been received from thirty-seven householders in Croxted-road calling attention to the grave depreciation that is occurring in one of the best residential districts in the borough owing to the inability of the present surface of the carriageway of Croxted-road to withstand the heavy motor omnibus and other traffic passing over it. The houses in the road are suffering most seriously from vibration and disturbance, which could be vastly mitigated, if not entirely removed, by a reconstruction of the surface of the road. The petitioners have been informed that, having regard to the council's commitments for the present financial year, the reconstruction of the carriageway of this road cannot be considered prior to March 31st next.

Middlesbrough T.C.—The Streets Committee recommended that Stockton-street be paved with soft wood blocks, at an estimated cost of £4,540.

Surrey C.C.—In a supplemental report the county surveyor (Mr. A. Dryland) states that the experience of the past year has confirmed the opinion he had before expressed as to the satisfactory results of the tarred slag road surfaces, the repairs to which had been trifling. For the fifth year in succession a census of the traffic on the Portsmouth-road at Kingston Hill had been taken on seven successive days in July, and the total number of vehicles and horses (led or ridden) was 18,727 compared with 14,963 in 1909. The number of motor cars and cycles had doubled, also the motor vans, while steam lorries had more than quadrupled. Motor omnibuses, which now appeared for the first time, numbered 1,235. Horse-drawn trade vehicles decreased from 1,974 to 522, but passenger vehicles increased from 776 to 1,103. Bicycles decreased from 6,129 to 4,094.

SEWERAGE AND SEWAGE DISPOSAL.

Bradford T.C.—The Sewerage Committee recommend the council to accept the tender of Messrs. Wm. Best & Sons, at £121,616, for the construction of the outfall sewer tunnel at Esholt.

Bury (Lancs) T.C.—The tender of Ames-Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, has been accepted for the supply of their patent "Simplex" sewage distributors, for the percolating filters about to be constructed.

Canterbury T.C.—The corporation have accepted the tender of Adams-Hydraulics, Limited, of York, for the supply and erection of eleven of their patent "Cresset" distributors at the sewage disposal works. Mr. A. C. Turley, city surveyor, is engineer for the scheme.

Crediton U.D.C.—The Local Government Board having written asking what steps had been taken in connection with the proposed sewerage scheme, the council have decided to discuss the matter at the next meeting.

Doncaster R.D.C.—It has been decided to prepare a sewerage scheme for Barnborough.

Durham R.D.C.—In order to prevent future flooding the council have adopted proposals by the surveyor, Mr. G. Gregson, for sewerage extensions at High Pittington, at an estimated cost of £150.

East Ashford R.D.C.—Plans for a drainage scheme are being prepared by the surveyor, Mr. J. H. Wilde.

Folkestone T.C.—Messrs. Mansergh have received instructions to proceed with a sewerage scheme, the estimated cost of which is £29,000.

Handsworth U.D.C.—The council have accepted the tender of Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, for the supply of their patent "Simplex" rotary sprinklers for their sewage disposal works extension.

Helmsley R.D.C.—A sewage disposal scheme for Gilling has been prepared by Messrs. Fairbank & Sons, of York.

St. Albans T.C.—A scheme for the sewering of the added areas has been prepared by Mr. H. Howard Humphreys. Part of it has been adopted, and the rest, dealing with surface-water drainage, has been referred back to the Urban Committee. The estimated cost of the sewerage scheme is £48,976.

Tyldesley (Lancs) U.D.C.—The council have placed an order for seven 80-ft. diameter Adams' patent "Adamic" airlock revolving sprinklers for the sewage works extensions.

Wandsworth B.C.—With a view to prevent storm flooding, the council have passed a resolution again urging the London County Council to extend the storm relief sewer in Balham High-road to the Falcon brook sewer.

Wirksworth U.D.C.—The council have accepted the estimate of Adams-Hydraulics, Limited, of York, for the supply and erection of three of their "Cresset" frictionless airlock sprinklers for the new sewage works. The engineer is Mr. H. Johnson, Bradford, and the contractors Messrs. Parker & Sharp, of York.

WATER, GAS, AND ELECTRICITY.

Brampton R.D.C.—The council have instructed Messrs. Taylor & Wallin, of Newcastle-on-Tyne, to prepare a scheme and report upon the water supply of Cumwhitton, Cumberland. Water will probably be obtained from springs by gravitation, and several miles of water mains will be required. This is the fifth scheme the Brampton Council have entrusted to Messrs. Taylor & Wallin.

Brighton T.C.—The Waterworks Committee submitted yesterday to the council a report from the waterworks engineer recommending the provision of an additional reservoir in connection with the Shoreham pumping station.

Chelmsford R.D.C.—It has been decided to prepare a scheme for a water supply at Great Baddow.

Cardiganshire C.C.—It has been agreed to make a complaint to the Local Government Board that the New Quay Urban District Council are in default in providing their district with an adequate water supply.

Evesham R.D.C.—The council have adopted a scheme which has been prepared by Messrs. Willcox & Raikes for the water supply of the populous portions of the parish of Harvington, the water being obtained upon terms from the mains of the Evesham and Pebworth Joint Water Committee. The present proposal is an extension of the Evesham villages water supply scheme.

Heckmondwike U.D.C.—Tenders are being obtained for laying a water main from near the Junction Inn to the reservoir gates, and the surveyor, Mr. J. Saville, has received instructions to complete the laying of a 4-in. water main in Chapel-lane.

Kidderminster R.D.C.—The surveyor, Mr. G. J. Shepherd, on Tuesday presented an estimate, at £439, for a water scheme for Churchill from the supply of the Stourbridge and District Water Board, and the council decided to seek the sanction of the Local Government Board to the scheme.

Kingsbridge R.D.C.—The tender of Messrs. Best Brothers, Teignmouth, at £416, has been accepted for the construction of works of water supply at Stokefleming.

Margam U.D.C.—Negotiations are going forward for the purchase of a site for the enlargement of the water storage to 160,000,000 gallons. The cost of the scheme is, approximately, £45,000.

Newport (Mon.) T.C.—The waterworks engineer, Mr. H. Tremelling, has prepared a report on the proposal to construct a new reservoir at Henllys, so as to meet the growing needs of the district. The proposed reser-

[illegible] will have a gallery area of 33 acres, which is greatest depth will be [illegible] and the [illegible] level will be [illegible] above ordnance datum. The total storage capacity will be 200,000,000 gallons. It is estimated that the water running to waste in the alley has varied from 209,000,000 gallons to 1,197,000,000 gallons per annum. [illegible] taining Parliamentary powers. It will be necessary [illegible] £120,000.

Penistone U.D.C.—The council have obtained a yield of water amounting to 7,500 gallons an hour from a borehole 300 ft. deep, and it has been decided to lay a water main 8 in. in diameter from the site of the [illegible] pump it was decided that Mr. Charles Chapman, of [illegible] should be called in to advise the council.

Penryn T.C.—It was reported last week that the council's special committee had met the committee of the Falmouth Town Council and had agreed that a letter be written to the Falmouth Waterworks Company inquiring upon what terms they would be disposed to sell their undertaking.

Saffron Walden T.C.—The tender of Messrs. Davey, Paxman & Co., of Colchester, at £347, has been accepted for a new boiler at the waterworks, and the tender of Messrs. W. Bell & Sons, at £21, for alterations necessitated by the new boiler to the structure of the engine house.

Southam R.D.C.—A committee has been appointed to decide the question of a water supply for Hodnany. —With respect to the boring operations for the Southam water supply, it was reported that satisfactory results had been obtained so far from the white rock at a distance of 2 ft., and the council sanctioned further expenditure upon the works with a view to obtaining a supply. [illegible] the Local Government Board.

Stafford T.C.—The council on Tuesday accepted the tender of the West Gas Improvement Company, at £17,473, for providing a Glover-West continuous system of vertical retorts, and £1,740 for the foundations, subject to the sanction of the Local Government Board.

MISCELLANEOUS.

Barnes and Mortlake U.D.C.—It has been agreed to purchase a 60-ft. fire escape from Bayley, Limited, for £[illegible].

Housing Loans to Local Authorities.—In the House of Commons on Tuesday, Mr. Herbert Samuel stated, in reply to a question, that the amount of the loans advanced to the authorities of boroughs and urban districts under the Housing, Town Planning, &c., Act, 1909, was £1,529,909, the number of houses to be erected being [illegible]. To rural district authorities the amount [illegible] was £319,880, for 1,716 houses.

PERSONAL.

Mr. W. Granger Goole has been appointed [illegible] in the Loughborough Town Council.

Mr. W. W. Shennan, sanitary surveyor to the Wirral Rural District Council, has received an increase of salary.

Mr. J. H. Harris, of Chatham, was last week appointed surveyor and inspector of nuisances to the Penryn Town Council.

Mr. G. Edwards, water engineer to the Leicester Corporation, was on Tuesday last voted an increase of salary from £450 to £600 a year.

Mr. Thomas G. Caink, borough engineer, King William's Town, South Africa, has been elected a member of the Royal Sanitary Institute.

Mr. Thomas Cole has been elected hon. secretary of the Institution of Municipal and County Engineers in succession to the late Mr. Charles Jones.

Mr. H. W. A. Carter, surveyor to the Matlock Bath Urban District Council, has received presentations from colleagues and friends on his retirement.

Mr. J. W. Stevens, surveyor to the North Walsham Urban District Council, has been voted £30 for his work in connection with the preparation of a sewerage scheme.

Mr. J. S. Pickering, the president, and Mr. W. Nisbet Blair have been appointed to represent the Institution of Municipal and County Engineers on the Organising Committee of the International Road Congress, 1915.

Mr. A. G. Wheeler, surveyor to the Eastwood (Notts) Urban District Council, has received a vote of thanks from the council for his energetic organising work in connection with the arrangements for the recent Road [illegible] to the district.

Mr. [illegible], M.INST.C.E., borough engineer of Hackney, who has been discharging the duties of the town clerk for the past nine months, has received from the borough council a special grant of £200 guineas in respect of extra services.

Mr. A. Dryland, surveyor to the Surrey County Council, has had his salary increased to £1,000 a year from April 1st last, on the understanding that all fees received by him for extraordinary services be paid into the county fund. It will be remembered that at the last meeting of the council it was decided that the honorarium of £52 10s. received from the Road Board by the county surveyor should be so paid, but at the same time it was referred to the Highways Committee to consider the question of increasing Mr. Dryland's salary.

Mr. W. E. Horsman, 127 Pendle-road, Streatham, for over thirty years representative of Messrs. George Waller & Son, Phœnix Ironworks, Stroud, makers of sanitary ironwork and appliances, and now in business on his own account, was presented recently by Mr. B. B. Waller, on behalf of the firm, with a handsome silver fruit stand as a souvenir. In making the presentation Mr. Waller enlarged in felicitous terms upon Mr. Horsman's business and social qualities, and at the same time presented a gold bracelet to Mrs. Horsman, and a parcel of interesting books, the gift of Mr. George Waller and Miss B. Waller, to Mr. Horsman's younger son.

Mr. Thomas Cook, city engineer of Worcester, a paper by whom on the sewage disposal of that city appeared on another page, commenced his professional career in the office of a land surveyor of extensive practice in the Midland and was engaged in surveys of large estates and parishes. He became assistant to the engineer of the Malvern Urban District Council, and afterwards surveyor and gas engineer to the Teignmouth Urban District Council. Ill-health of a member of his family necessitated his resigning the latter appointment. He afterwards became chief assistant to Mr. S. G. Purchas, M.INST.C.E., city engineer to the Corporation of Worcester, who died in 1894, and whom he was unanimously elected to succeed.

Messrs. G. P. Robertson, municipal engineer, Darjeeling Municipality, Archibald James Ross, surveyor to the Lutterworth and Monks Kirby Rural District Council, George Edwards Crowter, engineer and surveyor to the Godstone Rural District Council, Bertie Morley, borough surveyor, Tenby, and Leonard Randerson, surveyor to the Strood Rural District Council, have been elected members; W. H. Jarvis, assistant surveyor to the Erith Urban District Council, an associate member, and G. E. Harwood, borough engineer's office, Accrington, and H. S. Lambert, borough engineer's office, Bridlington, students of the Institution of Municipal and County Engineers. Mr. T. S. Griffin, engineering assistant under the Wolverhampton Corporation, has been transferred from the class of student to that of associate member.

FOR OTHER ADVERTISEMENTS

See End of Paper.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.

SECOND ASSISTANT SURVEYOR.

The above Council are prepared to consider applications for the appointment of Second Assistant in the Engineer's and Surveyor's Department. The person to be appointed must be a good Draughtsman and Surveyor, and possess practical knowledge of the work of a Municipal Engineer's Office. Preference will be given to candidates who hold the diploma of the Institution of Municipal and County Engineers, and who have had experience in the preparation of Plans, Specifications, Estimates and Quantities. Age not to exceed 28 years. Salary £100 per annum,

[illegible] subject to satisfactory service, by annual increments of £10 to a maximum of £120.

Applications, on Forms to be obtained from Mr. J. G. Carey, Assoc.M.Inst.C.E., Engineer and Surveyor, Council House, Hounslow, together with copies of three recent testimonials, to be sent to the undersigned not later than noon on Wednesday, the 12th August, 1914, endorsed "Second Assistant Surveyor."

Canvassing will be deemed a disqualification.

(By order)

H. J. BAKER,
Clerk to the Council.

Council House,
Hounslow.
30th July, 1914. (1,827)

URBAN DISTRICT COUNCIL OF FLEET, HANTS.

FLEET SEWERAGE AND SEWAGE DISPOSAL WORKS.

The Urban District Council of Fleet invite Tenders from responsible and experienced Contractors for the Construction of these works, which comprise about 16 miles of Stoneware and Cast-iron Sewers, Brick, Concrete, and Cast-iron Manholes, Flushing Tanks, Ventilating Shafts and Columns, Cast-iron Rising Mains, Air Mains, Engines, Compressors, Ejectors, Ejector Stations, Engine-houses, Balancing, Detritus, Sedimentation, Upward Flow, Storm and other Tanks, Percolating Filters, Humus Channels, Laying Out Storm-water Area, Roads, Paths, and other incidental works.

The Plans can be seen and a copy of the Specification, Quantities, and Form of Tender obtained, on and after the 20th July, 1914, at the Offices of the Council's Consulting Engineer, Mr. T. J. Moss-Flower, C.E., by appointment at 28 Victoria-street, Westminster, S.W., and at any time at Carlton Chambers, Bristol, on deposit of a £10 Bank of England note, which will be refunded provided a *bonâ-fide* Tender be received and is not withdrawn before the sealing by the Council of one of the Tenders, and provided also that all the documents supplied be returned to the Engineer.

On production of a receipt for the deposit a copy of the Plans may be inspected at the Council Offices, Fleet, on such days and at such times as will be communicated to firms tendering.

Sealed Tenders, endorsed "Tender for Fleet Sewerage and Sewage Disposal Works," are to be delivered at my Office at Fleet not later than 3 o'clock in the afternoon of Thursday, the 20th August, 1914.

The lowest or any Tender will not necessarily be accepted.

(By order)

W. H. WRIGHT,
Clerk to the Council.

Council Offices,
Fleet, Hants. (1,777)

BARNET URBAN DISTRICT COUNCIL.

TAR-MACADAM.

Tenders are invited for Providing and Laying Tar-macadam, in Wood-street, Barnet, of an average thickness of 4 in., and of a superficial area of about 6,400 super. yards, on the following terms:

1. That the cost be spread over 18 months from completion of the work, in three equal payments.
2. That the work be guaranteed for 2 years, free of cost.
3. That the paving be maintained for an additional 3 years at a cost to be stated per yard super.

The Council will prepare the surface of the road for the reception of the Tar-macadam.

Full particulars can be obtained upon application to Mr. W. B. Chancellor, Engineer and Surveyor, No. 40 High-street, Barnet.

Quotations, endorsed "Tarmacadam," accompanied with a full description of the stone proposed to be used, together with samples of the same, in an untreated and treated state respectively, must be addressed to me and delivered at the Council Offices, No. 40 High-street, Barnet, on or before the 24th inst.

The lowest or any Tender will not necessarily be accepted.

H. W. POOLE,
Clerk of the Council.

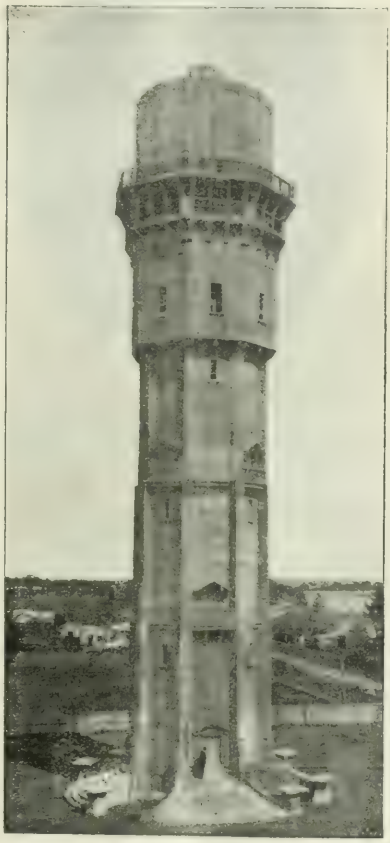
July 29, 1914. (1,828)

WATER TOWER, HAWERA, NEW ZEALAND.

The origin of this tower is very interesting, as before it was built the town of Hawera had to depend on water mains alone for fire prevention purposes, and these had proved to be quite inadequate, a test showing that the pressure dropped from 59 to 18 lb. with only four leads of hose connected up. To remedy this (states the *Indented Bar Bulletin*) the council had the choice of duplicating the mains or building the tower, the latter course being finally decided on, as the estimated cost was less than one half of the first proposal.

The tower includes two tanks, the upper one having a capacity of 100,000 gallons and the lower one of half this amount. The internal diameter of the tower and lower tank is 25 ft., the internal diameter of the top tank is 30 ft., the height of the structure being 166 ft. to the top of the concrete. The highest level of the water is 153 ft. from the ground.

An official test showed that the pressure from the top tank, which is connected up by a 10-in. pipe, was



Hawera Water Tower.

66 lb., and this fell to 51 lb. when the same four nozzles as were used from the mains were coupled on. Moreover, a further two additional nozzles can be connected without reducing this latter pressure.

Several storms and high winds have occurred since the tanks were filled, but there has been less than ¼ of an inch total settlement, so that the tower may be considered a great success.

In addition to the outside buttresses seen in the reproduction, a central octagonal column extends right up to the underside of the top tank.

Mr. J. C. Cameron, borough engineer, was responsible for the design and construction of this water tower, and he is to be heartily congratulated on the dignified appearance of this exceedingly useful building. Indented bars were used as reinforcement.

Worcester Sewage Disposal Works.*

[illegible]

[illegible] mitted to their respective destinations.

The author's reasons for this view is that the longer the foul solids remain in contact with the water the fouler the latter becomes, and the greater demand is made upon the purifying arrangements to restore [illegible]

MR. [illegible] CAINE (ASSOC. M.INST.C.E.)

[illegible] purification are less likely to be offensive to residents in the neighbourhood of the purification works, a consideration which will finally prove to be of paramount consideration.

The city of Worcester, which at the last census had a population of 47,987, is situated on the banks of the river Severn. It is 130 miles from the source of the river, measured along its course, and 60 miles from its estuary. The dead low summer daily flow of the river at Worcester is about 163,000,000 gallons, and the daily ordinary winter flow is estimated at 327,000,000 gallons; the width through the city averages about 200 ft., and the depth in the navigable channel 11 ft. The summer level of the river at Worcester, which is determined by the crest of the Diglis Weir, is 34·65 above ordnance datum. The highest flood level it has attained in recent times is 51·31 ordnance datum, to which it rose at Worcester Bridge on May 14, 1886. The general level of the land adjoining the river is 47·5 ordnance datum. A considerable number of small dwellings have their floor levels below 48 ordnance datum, and are therefore subject to flood. The general level of the city is about 78 ordnance datum, the highest point—viz., Elbury Hill—having an altitude of 317 ft. above sea level.

The river overflows its banks, on an average, about twice a year. The annual average rainfall of the district is about 25 in.

The city was sewered in 1858 on the combined system by the late Mr. Thomas Hawksley, past-president of the Institution of Civil Engineers. Into that system all the [illegible] sewers have been made to discharge. In about one-tenth of the city rain-water conduits have been laid diverting the water from the road surfaces to separate outfalls.

Before the construction of the disposal works the sewers had two main outfalls into the river on the left and right banks of the river, called Diglis and St. John's outfalls respectively, conveying the sewage from the portions of the city situated respectively [illegible] has a population of about eight-ninths, and the latter one-ninth of the total. The outfall on the west bank [illegible] not far from the centre of the city; that on the east bank is 800 yds. further down the river.

For the purpose of discontinuing the pollution of the river by the city sewage disposal works have been constructed on the west side at a distance below the the Diglis outfall of about 600 yds. A scheme of outfall sewers for the purpose of diverting the sewage from the old outfalls to the proposed disposal works was carried out by a firm of consulting engineers. From the St. John's outfall a cast-iron sewer 24 in. diameter, with manholes at intervals consisting of cast-iron square shafts 3 ft. 6 in. square, was laid running generally parallel to the river to the point where the new outfall sewer from the east side crossed the river at which, as originally constructed, it joined it. Storm overflow weirs are provided in the diverting chambers which come into operation when the pumping capacity at the works—which equals six times the dry-weather flow—is exceeded. In the walls of the overflow weirs and below the summer level of the river, sluice valves are built, through which river water can be admitted to the pipes conveying the sewage to the works.

Adjoining the chamber on the east side of the river at Diglis are two other chambers controlled by valves, from each of which a 20-in. cast-iron sewer descends vertically to a depth from the surface of 60 ft., and below the level of the river bed of 31 ft. These pipes enter and are laid along the concrete floor of a circular cast-iron tunnel 6 ft. 6 in. internal diameter, built in sections in its circumference, and bolted together in lengths longitudinally of 3 ft. The tunnel extends to the west bank of the river where the pipes terminated in two vertical shafts, each 4 ft. square, constructed of concrete, and enclosed within a circular cast-iron shaft 13 ft. 6 in. diameter. These concrete shafts had their outlets at a height of 36 ft. above the inverts of the 20-in. pipes into a chamber common to both from which a 36-in. cast-iron sewer extended, after being joined by the St. John's outfall sewer, to the disposal works at a gradient of $\frac{1}{555}$. This arrangement formed under the bed of the river an inverted syphon in duplicate. It was subsequently altered, as it was found that the velocity of flow up the vertical shafts was not sufficient to carry up the detritus and other solids of the sewage.

The difference of level between the floors of the chambers on the east and west sides of the river was 1 ft.; the maximum velocity, however, was determined by the difference of level between the height of the storm overflow weir and that of the water in the 36-in. sewer when conveying the maximum flow—viz., 12,000,000 gallons per day. . . The alteration of the arrangement consisted in abandoning the vertical shafts and uniting the two 20-in. pipes into one 24-in., and continuing it to the works with a descending gradient of 1 in 500, the depth of this pipe being generally about 52 ft. below the surface of the land. This pipe was laid in a tunnel, and as the material driven through was hard marl, not much difficulty was experienced beyond the rather large quantity of ground water that had to be negotiated. The 36-in. sewer was still retained for conveying the St. John's sewage which is discharged into the 24-in. sewer down a vertical pipe 20 in. diameter on the site of the works at a point where the sewer is increased to 26 in. diameter, and extends to the screen house (Plate 1). After entering the valve chamber (Plate 7) it divides by a Y branch, each controlled by a 26-in. valve, and enters the shafts containing the screens.

Owing to the depth of the sewer and the fact that the sewage rises in the pump well considerably above the level of the sewer, the screens are always submerged when in operation. The screens are cubical in shape, 5 ft. 3 in. by 4 ft. 10 in. by 6 ft. 6 in. high, and constructed of expanded steel upon angle steel framing, with a top of perforated steel. They sink to a depth of 63·5 ft. below floor of house in shafts 6 ft. 6 in. square. The shafts are constructed of blue brick in cement, and secured with steel bars 3 in. by $\frac{3}{8}$ in., riveted together to form complete rings of the same shape as the brickwork, partly rectangular and

* Paper read at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham

partly semi-circular. The inner faces of the shafts are cement rendered. The open side of the screen next the meet is placed close against the face of the wall, the other three sides are distant about 10 in. to permit of the free passage of the screened sewage to the outlet. The screens are raised and lowered by electric hoists with D.C. motors, 460 volts of 9-horse power each, carried on a traveller, by which the screens are removed on one side for cleaning. The entire arrangement is enclosed in a brick-built and slated house (Plate 6), 40 ft. by 19 ft. by 14 ft., to the wall plate. Stages approached by iron ladders are constructed in the valve chambers to give easy access to the valves when needed. The ground around the house was raised 9 ft. to place the floor above flood level.

The sewer on leaving the screen shafts extends to the detritus or pump well. This well is constructed at the north end of the engine-house (Plates 4 and 5), of which it forms a wing. It is circular in form, lined with blue Staffordshire bricks in cement, backed with cement concrete. It has a spiral staircase descending to the top of the cone, which constitutes the lower end of the well, and is approached from outside the building. The staircase is of granolithic, with one end of the steps built into the wall. The outer side is provided with an iron handrail.

The diameter of the well is 20 ft. to a depth of 50 ft., where it reduces to 14 ft., forming a gangway 3 ft. wide around the circumference. This reduction of the diameter was occasioned by having to increase the depth of the well consequent upon the laying of the deep sewer on the abandonment of the inverted syphon under the river, and was done to avoid undercutting the then existing masonry. For a height of 9 ft. 6 in. from the bottom the well is conical, the bottom of the cone having a diameter of 3 ft., the sides making an angle from the horizontal of 60 deg. The total depth of the detritus well is 84 ft. The well is covered over with steel joists in concrete, forming the floor of a store on a level with the engine-house floor—viz., 58 ordnance datum.

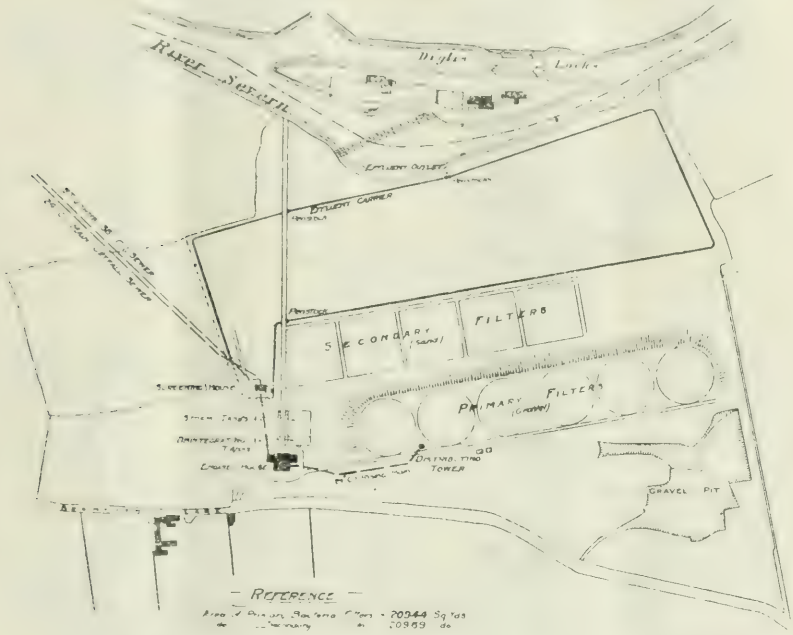
The sewer, which is at this point 26 in. diameter, enters the well at a depth of 71 ft. 6 in. from the top and 12 ft. 6 in. from the bottom, and is usually submerged to a depth of 47 ft.

A hydro-pneumatic sludge lift is fixed at the bottom of the cone (Plate 5), and rises vertically up the centre of the well discharging into wooden trough a distance of 140 yds. from the engine house. The detritus or sludge lift consists of 6-in. vertical cast-iron pipe, into the lower open end of which air is pumped, and is so far similar to the ordinary air lift. The object sought in the arrangement is to obtain an upward flow through the vertical pipe of a velocity sufficient to carry whatever heavy matter is carried into the well. In order, however, to secure that the water which is to convey the solids up the pipe is not obstructed by the accumulation of detritus around the mouth of the lift pipe, the pipe is surrounded by a larger pipe having a diameter of 15 ins., forming an annular space between the two. From this space a number of tubes are connected penetrating the accumulated matter near the mouth, and conveying the water lying above the detritus to the mouth of the lift. The air jet is covered with a loose glass ball [illegible] on a cage to prevent the silt from entering the air pipe when not in use.

The trough into which the solid matter is discharged is 100 yds. long, and is laid along an embankment at the extreme north side of the works. It is 3 ft. wide and 15 ins. deep, and is divided longitudinally into two by a weir running its entire length, the trough into which the sludge is discharged being 2 ft. wide, and that for conveying the supernatant water to the sewer 1 ft. wide.

The detritus and lighter matter which are raised from the well by the air lift are automatically separated in the trough, the heavier matter being first deposited, then the lighter as the velocity of the water along the trough conveying it diminishes by overflowing the longitudinal weir on its way to the outfall sewer, by which it is returned to the well. The deposited matter is shovelled out of the trough on to the bank along which the trough is laid. In course of years the stuff will extend across a piece of land not otherwise used for the disposal of sewage. As the solid matter raised by the sludge lift is almost entirely of a non-putrifiable character, and is taken out very shortly after its arrival at the works, no nuisance from smell has been experienced.

The sludge lift is a very efficient appliance for raising such heavy material as sand, pebbles, pieces of coal, and the like, as well as lighter matter. Pebbles weighing three-quarters of a pound have been lifted from the bottom of the well, which is 85 ft. deep, and conveyed along the delivery pipe into the trough. The apparatus adopted is capable of lifting 20,000 gallons per hour from the bottom of the well containing one-fourth its volume of silt with a consumption of electricity in the air-compressor of 20 B.T. units



General Plan, Worcester Sewage Disposal Works. Plate 1.

per hour. A vertical pitelle electrically driven Roe Rotative pump of a capacity of 25,000 gallons per [illegible] against a head of 80 ft. is fixed in the well with a D.C. motor of 25 h.p. resting upon the well covering. This pump is provided for emptying the well when necessary.

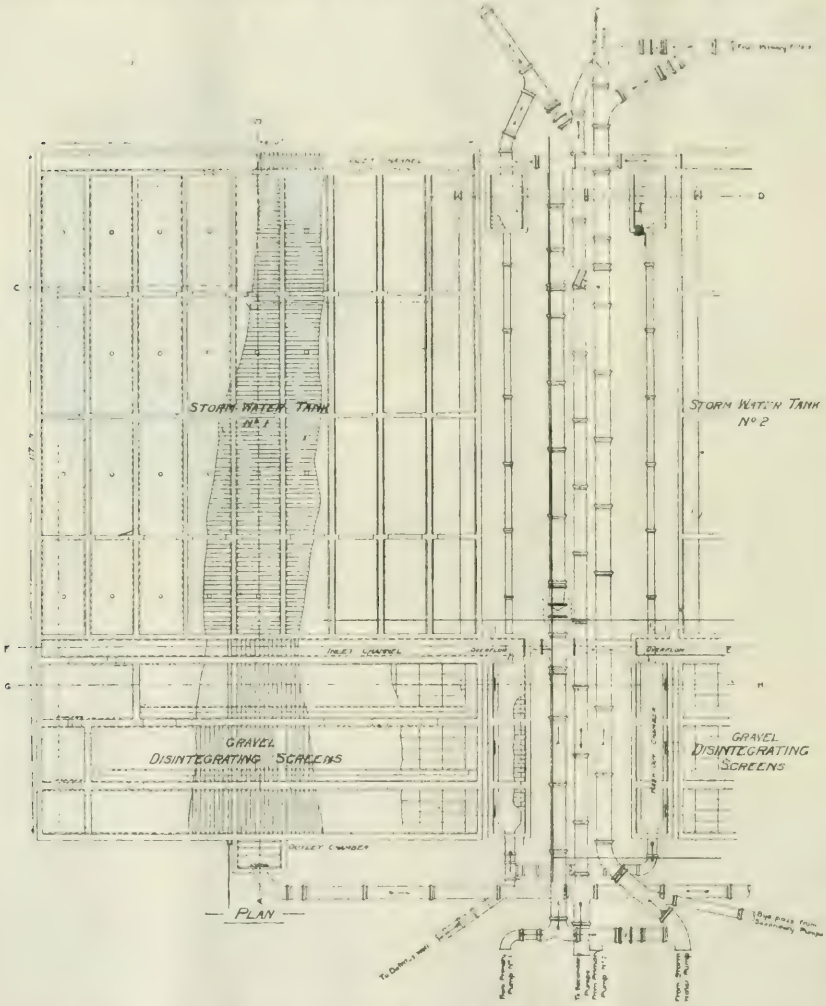
The engine and pump house (Plates 4 and 5) adjoins the well. Its inside dimensions are 55 ft. by 40 ft. by 26 ft. to wall plate. It is partly built in red bricks, with little projection either inside or outside to decoration or costly material. A sunk chamber 44 ft. by 17 ft. by 24 ft. 6 in. deep is constructed lined with white glazed brick, for the purpose of placing the pumps at a suitable level for a moderate suction lift.

Below the floor of the sunk chamber is an arched chamber extending the entire length of the house with the floor at 18 ordnance datum. From the pump well a 42-in. cast-iron suction main extends along the lower arched chamber, and from it branches are taken to the two primary and one storm water pumps. A benching carried upon arches is constructed in the sunk chamber upon which the two secondary pumps are bedded. The two primary pumps have capacities respectively of two million and four million gallons per day, and the secondary pumps exactly correspond.

The storm water pump has a capacity of six million gallons per day. As the dry-weather flow is taken at two million gallons per day, the total capacity of the raw sewage pumps is equal to six times the dry-weather flow. Each of the two small pumps is electrically driven by a 45 h.p. D.C. motor coupled direct. The larger pumps are driven by belting from two Crossley gas engines, each developing 100 h.p., and fed with gas from Bowman's suction gas plants produced from anthracite. A gangway resting upon steel joists 12 in. by 6 in. bridges the sunk chamber from each gas engine for the double purpose of giving access to the fore part of the engine, and forming an abutment to resist vibration or displacement.

An overhead traveling crane of 6 tons capacity runs the full length of the engine house. The house also contains a Broom and Wade's air compressor of a capacity of 150 cubic ft. of free air per minute to 100 lb. pressure driven direct by a D.C. motor of 25 h.p. The compressed air is used for starting the gas engines, and for raising the sludge from the detritus well by the air lift. Two small stand-by air compressors are fixed in an adjoining room, one of a capacity of 55 cub. ft. of free air per minute to 30 lb., the other to 17 cub. ft. per minute to 80 lb. pressure, belt driven by a 12 h.p. D.C. motor. The latter machine is arranged also as an exhaust pump for priming the sewage pumps, and for exhausting the air from the syphons for starting the sewage sprinklers. An air receiver, consisting of a vertical cylinder 2 ft. 9 in. diameter by 8 ft. high, is lodged in an adjoining room used as a workshop, and a vessel of similar form and dimensions for the vacuum.

The primary pumps raise the sewage from the detri-



WORCESTER SEWAGE DISPOSAL WORKS: PLATE 2.

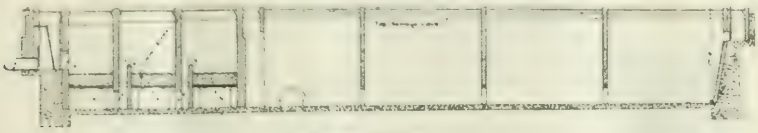
into well and discharge it into tanks in duplicate, which are used separately. (Plates 2 and 3). The tanks are divided into three chambers, 60 ft. by 10 ft., 60 ft. by 10 ft., and 60 ft. by 8 ft. The maximum depth of water is 15 ft. Cast-iron grids of 2-in. mesh are fixed 4 ft. 3 in. above the tank floors. The grids carry a 6-in. layer of [illegible] gravel, upon which is spread a layer of fine gravel 18 in. thick.

The sewage is conveyed to the first gravel screen chamber along an inlet channel 3 ft. wide running the entire length of the tank, which discharges into a channel which conveys it through an orifice opening to the cast-iron grid carrying the gravel. The sewage then flows upwards through the gravel, over a weir wall raised a little above the surface of the gravel, then downwards into the next chamber, where the gravel acts upon it through it and so with the third chamber carrying a similar arrangement of gravel, whence it is delivered to the engine house, where it is lifted by the secondary pumps to the distributing tower (Plate 4).

The transmission of the sewage upwards through the movements of the air due to varying levels of the upper surface without the escape of putrescible odours.

The tanks used for receiving the storm water were originally constructed as detention tanks, as required by the Local Government Board. They are in duplicate, each having a capacity of 50 times the dry-weather flow, and are used separately. They are divided longitudinally into bays 8 ft. wide by 9-in. walls carried to the surface. The total depth is 18 ft., the maximum depth of water 15 ft. Each bay has a separate inlet from one common channel running the full width of the tank (Plates 2 and 3), but having a water communication between them at the outlet end, so that there is no lateral pressure on the division walls. The tanks are roofed in with timber similar to that of the disintegrating screen chambers, and covered with sand. The storm water is decanted off to the effluent channel down to 4 ft. 6 in. above the tank floor, the remainder is returned to the pump well and treated as sewage.

The sewage, after passing through the series of



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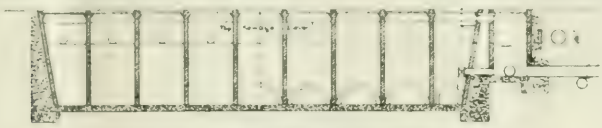

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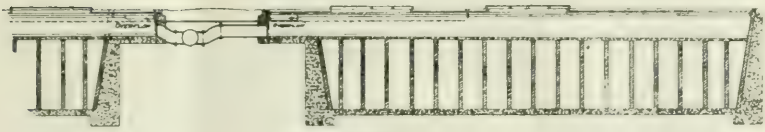

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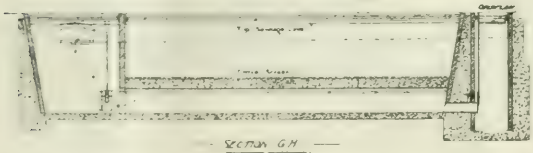


— Section GH —

— Section IJ —

Worcester Sewage Disposal Works Plate 3

[illegible], breaks up the putrescible matter in suspension into a fine state of subdivision before passing it to the distributors. The direction of flow through the gravel being upward there is no choking of the material by the arrested matter, the head of water being great enough to lift and loosen the gravel, and drive through it any material tending to obstruct the flow. The total water capacity of each tank is 172,000 gallons. When the sewage [illegible] gallon pump is running the sewage reaches the primary filters in about 2½ hours.

In consequence of the velocity of flow through the space under the gravel being reduced after leaving the inlet channel, a certain amount of suspended matter is deposited on the floors of the chambers. This deposit is removed daily by draining the water (when the pump is stopped discharging into it) back into the detritus well, and mixing it with the incoming liquid. This practice is important for preventing solid matter in any portion of the works from accumulating and becoming septic before reaching the oxidising filters.

The chambers containing the gravel disintegration screens are roofed with creosoted deal rebated planks 4 in. thick, and these are covered with a layer of sand 6 in. thick. This arrangement permits of the disintegrating screens, is returned to the engine-house and lifted by the secondary pumps to distributing tower, from which it is discharged under a maximum head of 10 ft. to the revolving distributors. This tower, which is circular in shape, is 20 ft. internal diameter. The depth of water 12 ft. It is constructed of blue brick in cement, armoured with complete rings of steel riveted together, laid edgeways in the brickwork, the distance increasing between the rings as the courses rise. Sufficient steel was built in to take the entire strain due to the pressure of the water, leaving the brickwork as the factor of safety. The interior is rendered with cement, making the structure watertight.

The author took advantage of this tower to obtain an inexpensive means of measuring the quantity of liquid treated upon the filters. The interior is divided into two chambers by a wall. In the upper part of the wall a 3-ft. gauge notch is built. A float with a spindle passing through the roof carrying a pointer moving in front of a scale indicates the quantity of water being discharged at any moment. A clock and drum recording the quantity throughout the twenty-four hours has not yet been provided. A cast-iron main conveys the liquid from

[illegible] cement concrete 6 in. thick, and fall 1 ft. from the centre to circumference. Three-inch agricultural land drains are laid on the floor radially, with rows of Stiff's tiles at intervals. The outer ends of the drains discharge into an effluent channel surrounding the floor at the foot of the interior slope.

The filtering medium, which is 8 ft. deep, consists [illegible] from the excavations in the site of the filters, the remainder from other parts on the site of the works. The gravel is screened and washed, but not graded. [illegible] filtering medium induced the author to attempt a means for getting air into the lower part of the material. Vertical pipes are provided standing 5 ft. high, surmounted by down draught cowls and connected to the effluent channel surrounding the bottom of the filter. These air pipes are 10 ft. apart around the filter, 60 to each bed.

The air is blown by the wind from any direction and diverted by the cowls down the pipes into the effluent channel, then along the drain pipes which convey the filtered effluent, and thence upward through the gravel meeting the liquid in its downward course to the drains. The effluent channel is air-trapped by a water-seal at its outlet to prevent the air finding an escape otherwise than through the gravel. With the view of making the down-draught cowls as efficient as possible, the author has designed a light aluminium automatic valve to prevent any portion of the air which enters the cowl at one opening from escaping at either of the others. They have not yet, however, been applied to them.

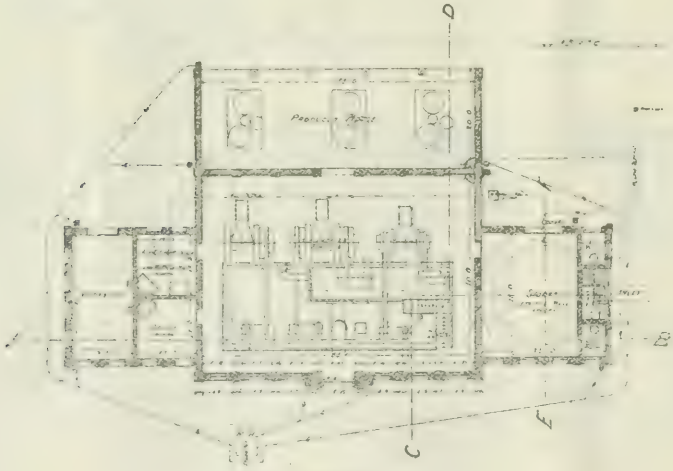
The distributors which supply the filters are of the revolving type, with single arms running on either steel or cast-iron rails resting on cement concrete tracks carried on concrete arches supported by piers of similar material carried down to the concrete floor of the filter. There are three tracks to each bed giving as many bearings to each arm. The distributors are syphon fed from cylindrical tanks at the centre 2 ft. 6 in. diameter, which receive the effluent from the lower end through 1¾-in. cast-iron pipes laid through the filtered material, and supported on concrete piers 12 ft. apart.

The ascending leg of the syphon feeding the distributor is suspended in the centre tank from the top of the descending leg, which passes down outside. The lower end of the descending leg is formed into an inverted syphon in the middle of which is a reflux valve, which opens outwards from the centre. The purpose [illegible] syphon when exhausting it to start the distributor. From the inverted syphon the arm extends for a length of 95 ft. from the centre — that is, within 5 ft. of the perimeter of the filter. The distributor pipe is 10 in. diameter at the ascending [illegible] 5 in. at the other extremity. The jets which are spraying jets similar to those patented by the author for the distributors of watering carts, are spaced so as to deliver equal quantities of liquid over equal areas throughout the entire length of the arm. The two spraying jets are 5-16ths in. diameter. There are 200 jets in each distributor, which, with a 5-ft. head, discharge on to each bed 1,000,000 gallons in twenty-four hours.

The effect of the spraying jets is to cover every part of the surface of the bed with liquid. One result of this is to destroy the larvæ of the innumerable flies that infest the surface of bacteria beds, and quite prevent the nuisance arising from that phenomenon. Another result of breaking up the liquid into a fine spray—a less fortunate one—is that foul odours from the liquid are likely to be conveyed to greater distances than if discharged from the arms in unbroken streams, and, as already has been said, the question of offensive odours will finally be the paramount consideration. Means must be provided for dealing with the offence when experience suggests it is likely to occur.

After reducing the period of transmission of the foul liquid to the shortest possible time, the question of odour becomes one of dilution, dilution of horse-

Elevation.



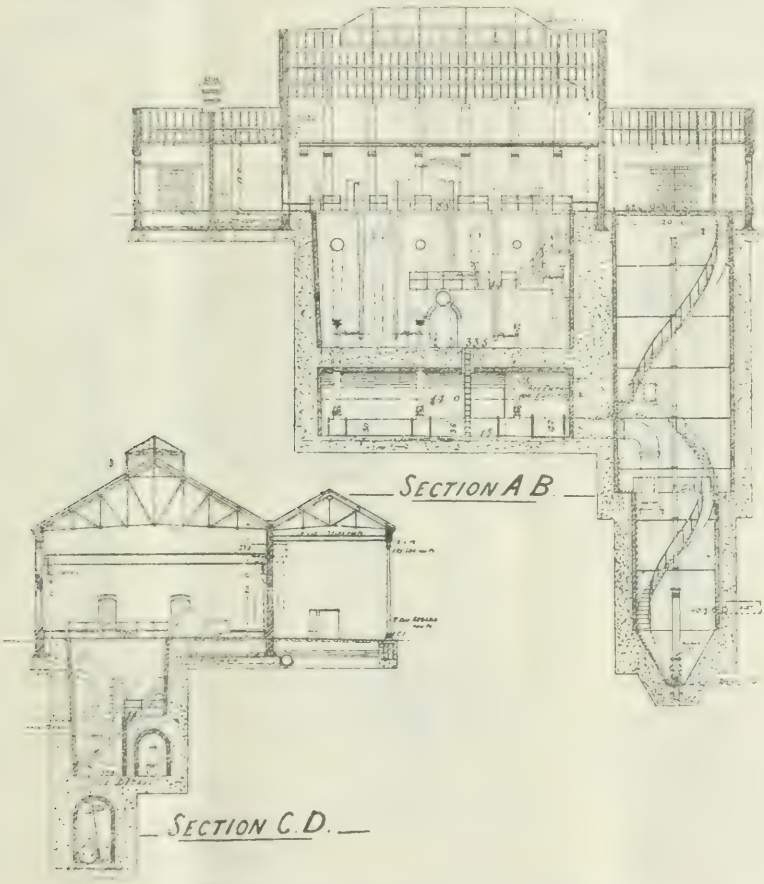
Engine House.

Worcester Sewage Disposal Works Plate I

[illegible] power [illegible] dilution [illegible] the filters [illegible] Dilution in [illegible] effect in [illegible] with a [illegible] filtering material which would otherwise [illegible] The diluting water in this case is taken from the river through 20-in. valves built in the weir walls [illegible] water passing therefrom to the outfall sewers. The degree of dilution is constantly changing, the quantity of river water being always the difference between the volume of sewage and the capacity of the pump then in use, which is allowed to run at its full load. [illegible]

float valve is fixed at its upper end, which closes [illegible] the pipe.

The distributor arms are borne at three points [illegible] tandem. The axles of these wheels run under anti-friction rollers, the axles of which are carried upon ball bearings, the object of the arrangement, of course, being to reduce friction to a minimum. These three pairs of carriages run upon concentric rails 7 ft., 80 ft., and 150 ft. diameter respectively, the outer ends overhanging the outer carriage cantilever fashion a distance of 15 ft. These distributors are almost identical in form with that which formed the subject of the author's patent taken out as far back as 1897, and which he thinks was the father of all the self-propelled sewage distributors which



Worcester Sewage Disposal Works: Plate 5.

the capacity of the pump, the sewage would flow through the valve into the river. It is therefore necessary that the level of the water in the river should always be higher than that in the mixing-chamber. To indicate whether such is the case gauges showing the height of the sewage and of the river are provided in the engine house, and these determine the pumps which are required to run.

In order to [illegible] and stopping of the distributors under easy control an arrangement is provided for doing this from the engine house. From the vacuum vessel already mentioned a 1-in. diameter air-pipe is taken to each filter and fixed up the centre of the ascending leg of the distributor. To start the sprinkler the pipe is opened to the vacuum when the air from the syphon is exhausted and the distributor started. To stop it, the pipe is opened to the atmosphere.

In order to prevent water being drawn into the air-pipe when exhausting the syphon for starting, a

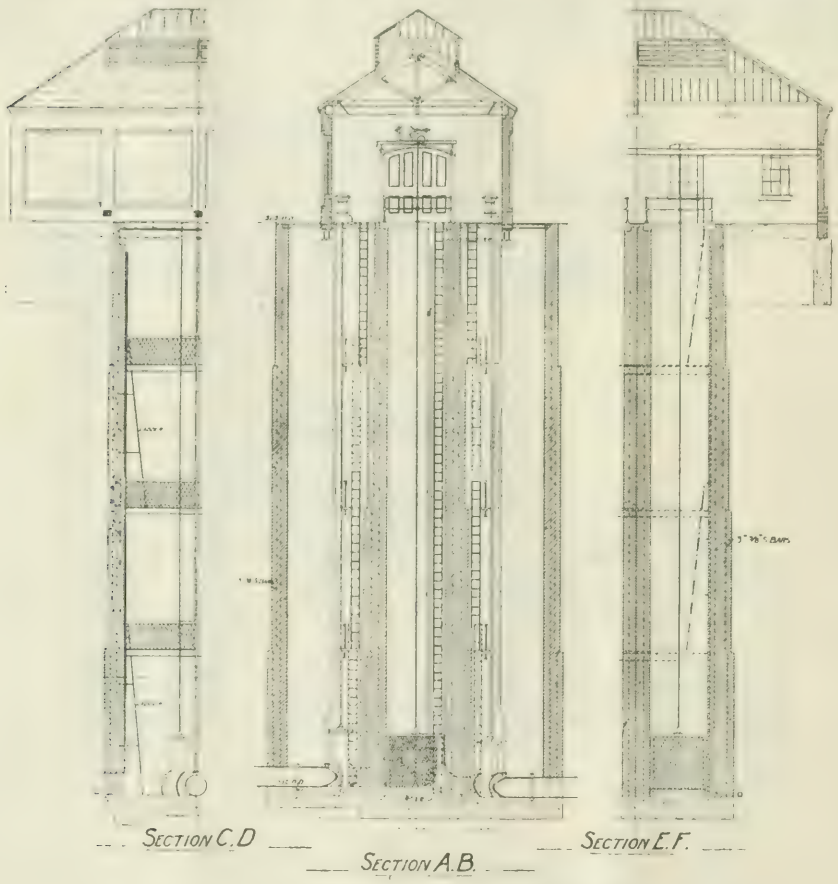
have been since introduced. The running of the distributors has shown that the anti-friction arrangements were needlessly over-elaborated. Wheels carried by simple ball-bearing axles would have amply sufficed.

It requires, of course, more power to overcome what has been called the stiction and inertia at starting than is needed to keep the arms running at a moderate speed. The consequence of this was that the distributors were found to reach a rather alarming speed after running for a short time, making a complete revolution of the 200 ft. diameter bed in thirty seconds. The author desired that they should make a revolution in about five minutes; he accordingly designed a form of brake for reducing as well as regulating the speed. It consists of a double fan of eight vanes of galvanised iron, the vanes measuring 9 in. by 6 in. The fan spindle is geared to the outer carriage wheels, which gives it rotation when the arm is moving. The resistance of the air to the rotation

[illegible] per minute. The air resistance varies at the square [illegible] The speed of revolution of the distributors can be altered by changing the angle at which the vanes strike the air.

The filtrate from the oxidising filters passes to the secondary filters. These are five in number (Plates 1 and 8), four of them 198 ft. sq., the fifth 198 by 17[illegible] ft., and have a total area of 20,[illegible] sq. yds. They are formed in excavation and embankment, are not enclosed in masonry, and have no paved floor. The filtering material is sand 3 ft. thick, screened from the gravel [illegible] the primary filters, [illegible] primary effluent through the secondary filters, it can be allowed to overflow direct to the outlet pipes in the carrier.

There is an area of about 17 acres which the Local Government Board required to be provided for irrigation; the effluent carrier entirely encompasses this land. Its dimensions are 3 ft. wide by 3 ft. 3 in. deep. The invert is of cement concrete, and the side wall of Staffordshire bricks in cement 9 in. thick. The wall next the irrigation land is 9 in. lower than the outer wall, so as to permit the effluent to flow over into the land. The effluent outfall discharges into the river a short distance below Diglis weir, and above the summer level of the river at that point.



WORCESTER SEWAGE DISPOSAL WORKS PLATE 6.

on a bed of gravel 1 ft. thick. They are under-drained by 3-in. agricultural drain pipes, which discharge into a brick channel running along the middle of the bed from inlet to outlet. A barrier composed of sand and gravel runs across each bed, dividing it into two parts, that nearest the inlet being one-third, and that next the outlet two-thirds of the area. The object of the barriers is to cause as much as possible of the humus carried from the primary filters to be deposited on the smaller areas, leaving the larger portions to allow the primary filtrate to pass through the sand.

Overflows are provided with bell-mouths standing about 15 in. above the sand surface. The outlet pipes, which are fixed in the final effluent channel, are raised so as to keep the secondary beds full and flooded as in waterworks' filters, valves, however, being fixed at the foot of the outlet pipes for draining the filters. The filtrate falls from the outlet pipes in cascades into the carrier. If it is thought unnecessary to pass the whole or any part of the It flows from a 3 ft. diameter brick culvert down a series of white glazed brick steps into the river.

The following is a summary of the cost of the works:

	£	s.	d.
Land	9,598	0	0
Screen-house and substructure ..	3,442	0	0
Outfall sewers, including tunnel	22,873	0	0
Screens and hoist	640	0	0
Pumping station and detritus well	8,635	0	0
Sludge lift, delivery main and depositing trough	352	0	0
Pumping machinery, air compressor and gas plant	4,922	0	0
Storm tanks, disintegrating gravel screens, valves	9,062	0	0
Conduits and valves ..	7,176	0	0
Distributing tower	310	0	0
Primary and secondary filters ..	30,306	0	0
Rotating distributors (Candy-Cainck) ..	2,475	0	0
Effluent channel and oufall to river	3,990	0	0
Compensation and wayleaves ..	1,318	0	0
Engineering, legal, miscellaneous expenses	8,609	0	0
Total	£113,708	0	0

It will have been noticed that a prominent feature

of this scheme is the absence of tanks for detaining the sewage prior to its transmission to the existing filters, the aim being to avoid having to deal with sewage sludge as sewage sludge until it had undergone sufficient digestion to render it innocuous. It was obvious that the adoption of such a practice would have the effect of choking the primary filters much sooner than would be the case if the organic solids were deposited in tanks. It was therefore necessary to provide facilities for the washing from the gravel the digested solids. Arrangements were accordingly provided for reversing the flow of sewage in the filters, converting the outlets into inlets, and inlets into outlets, and sending the liquid upwards through the filtering material so as to wash the gravel with the upward flow filtered effluent, passing it on to the land for the washings to settle, and the water to pass into the river.

It was found that after the filters had been in use about four months the upper layer of gravel to a depth of about 12 ins. was charged with sufficient solid matter to prevent the free passage of the liquid from the distributors at a rate equal to the capacity of the bed, and the author proceeded to wash the top layer of gravel by the upward flow filtered effluent. As nearly as an estimate of the cost of washing the gravel could be made, it would seem to amount to about £500 a year.

The operation of cleaning the gravel by this means induced the author to conduct some observations on upward slow filtration through the gravel as a normal method of sewage purification adhering to the lines already adopted in this scheme of physical disintegration of the solids through the gravel screens and quick separation of the liquid from the solids in the primary filters aided by dilution of fresh water from the river, which is always nearly saturated with oxygen.

If a satisfactory effluent could continue to be obtained by these operations, it was not difficult to see that with a single sweep practically all the problems which had troubled engineers for the past generation would be solved, and the cost of sewage purification reduced to a minimum.

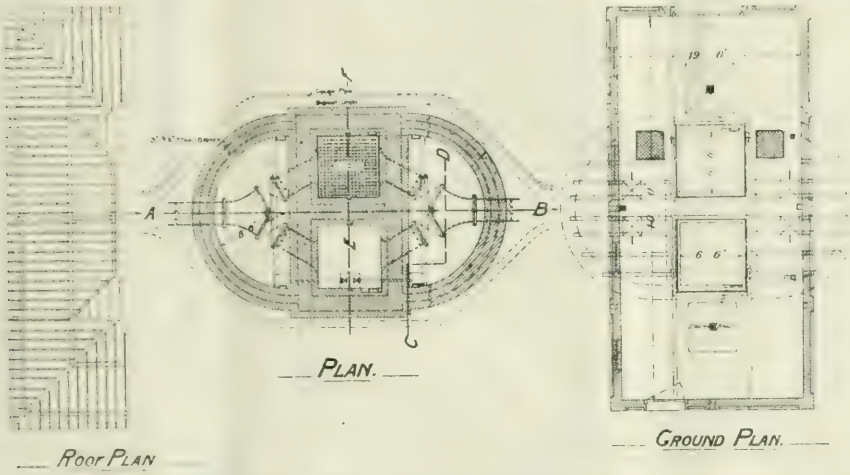
The aerial nuisance would be disposed of, because the liquid would not appear until it had been so far purified by its passage upwards through the filter. The fly nuisance could not exist, because the larvæ as soon as deposited would be carried away by the surface flow, and the most important and difficult of all, viz., the sludge problem, would seem to be easily and satisfactorily solved.

What was likely to happen and apparently is happening, is that after the putrifiable and such other organic solids have been broken up into a finely divided state in the disintegrating screens, they pass on with the liquid from the secondary pumps through under drains into the lower strata of the primary filters where they are immediately arrested, while the water passes away from them upwards. More solids are contributed day by day displacing upwards what has previously been intercepted. That process will doubtless continue until that which was first arrested becomes, by the force of the upward flow of the water, discharged at the surface. A state of equilibrium will then be reached; that is, the solids will be discharged at the surface at the same rate as they are deposited beneath, less what disappears by conversion into liquids and gases consequent upon the biochemical changes they have undergone during their slow upward transmission through the filter. By that time the solids will doubtless have become converted into an innocuous humus.

The process is intended to be amplified by passing the filtrate to the under drains of the secondary sand beds already described and filtering it upwards slowly through these beds. By keeping the outlets from these beds from 12 to 15 in. above the sand a sufficiently slow movement will be imparted to the water to allow the suspended matter which will be forced through the sand to settle down upon its surface, while the water, freed from suspended matter, will pass to the final effluent outfall. By drawing off the water from the beds, the precipitated matter which, after a little exposure to the air is converted into a hard cake, can be easily handled and removed with scarcely any interference with the sand surface, and will, I think, prove a valuable and saleable fertiliser, particularly if ground to powder.

A small amount of consideration will suffice to see that the operations described are almost exactly the inversion of the processes going on in the human body. Pure liquids and solids are introduced in the upper regions then pass downwards, undergoing certain natural digestive processes, and emerge fouled from the lower regions. There is one very important feature, however, of the analogy lacking. In the operations of the sewage purification described no certain and measurable provision is made for supplying oxygen to the filters, so as to carry on the process with a maximum efficiency such as respiration affords in the human economy. The author's view is that air should be pumped into the mains which convey the sewage to the primary filters and the mixture passed into the filters. By this arrangement a maximum of contact between the air, the water, and the filtering medium would be secured. The proper proportion of air to water would be matter for determination by experience, and it may be presumed would largely depend upon the strength of the sewage. This method of treatment would emphasise what is generally recognised, that modern sewage purification is the application of natural processes accelerated by artificial devices, or in other words, "intensive cultivation."

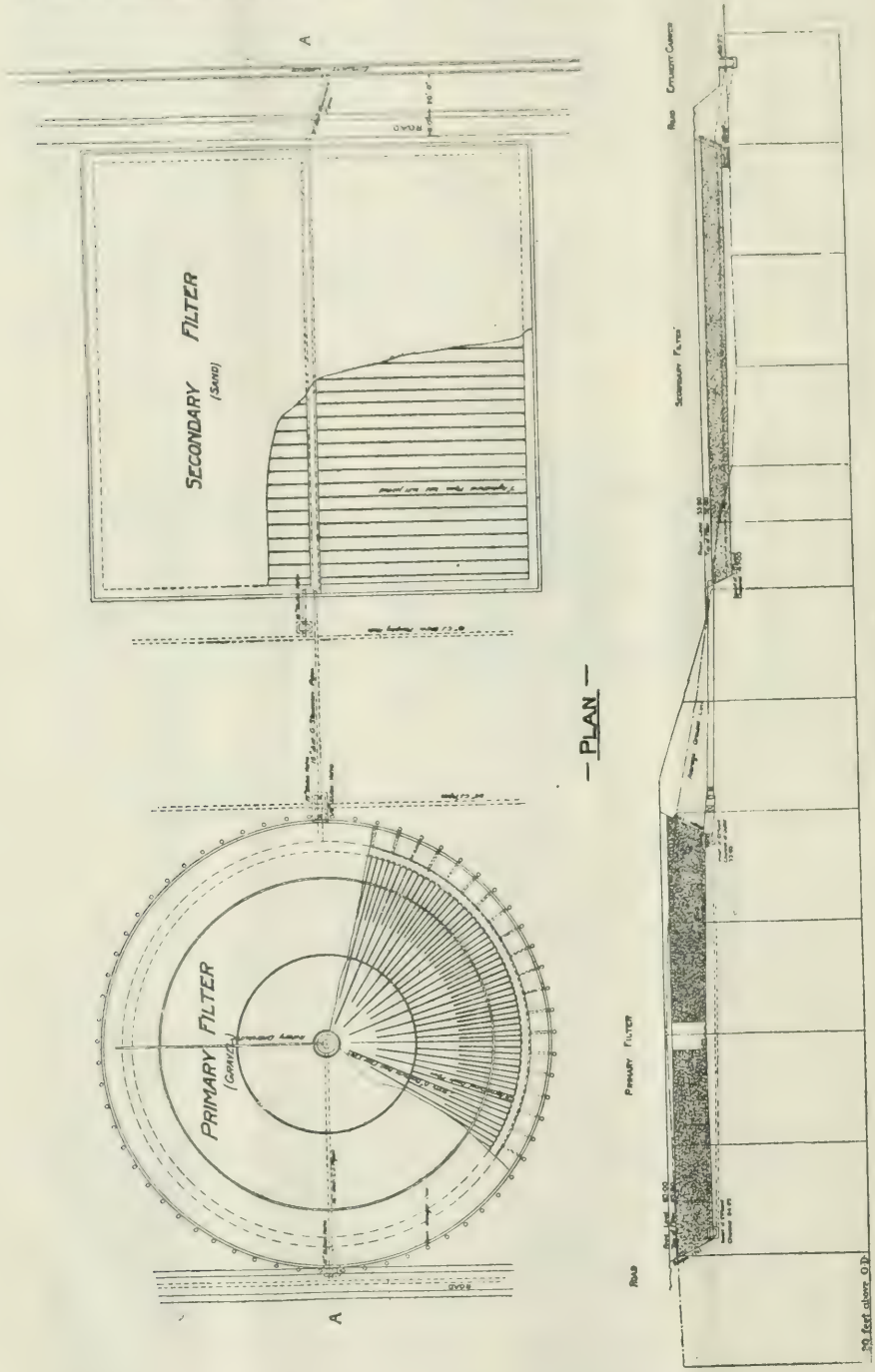
It is not difficult to see that this system of purification would involve a minimum of capital expenditure, dispensing as it would with large detention tanks, all forms of distributors, with the consequent dispensing of labour in keeping them clear, no labour



Worcester Sewage Disposal Works. Plate 7

[illegible] is necessary to keep the surface of the beds open [illegible] the passage of the liquid. The system could at most [illegible] only upon the natural fall, which [illegible] could not have to be [illegible] and [illegible] to force the water up at a cost [illegible] the [illegible] can now be pumped at a small cost, either by the best type of steam engines or, probably still cheaper, by internal combustion engines.

The above considerations point to an important distinction between the purification of water by filtration and that of sewage, indicating that the former is best effected by downward filtration, the latter by upward. The ordinary purification of water for public supplies consists almost entirely in removing the matters in suspension, whether mineral, dead organic,



PRIMARY AND SECONDARY FILTERS, WORCESTER SEWAGE DISPOSAL WORKS: PLATE 8.

various parts of the works. The conclusion from these considerations is that the cost of sewage purification will, like most manufacturing and other physical operations, become one of horse-power rather than of large capital outlay. A very large quantity of water

[illegible] the filter-bed material, the latter [illegible] placed. In the case of sewage, it is not usually advisable to use the material [illegible] and the cleaning of the filter-beds and [illegible] as well as that of the liquid itself, and at the [illegible] time to effect the sanitary point be delayed for some period within the [illegible]. If the [illegible] is drawn off [illegible] the surface becomes [illegible] and more [illegible] whereas by spread [illegible] the bed is kept loose and open [illegible] so that air both to the surface, the liquid [illegible] very quickly [illegible] slowly.

NORTHANTS AND EAST MIDLANDS SURVEYORS' ASSOCIATION.

A motor tour and visit to Peterborough and district on the occasion of the Agricultural Show was made by members of the above association recently. [illegible] Messrs. Chas. S. Morris, county surveyor; J. B. Williams, borough surveyor, Daventry; W. Mason and F. Cheney, county surveyors; N. E. Dixon, Oundle Rural; G. B. Chilvers, Oundle Urban; Thos. Lake, Bourne Rural; John Bailey, Spalding Urban; Messrs. Clowes and Pickwell, the Peterborough Rural surveyors; J. W. Walton, Peterborough borough surveyor; T. Lloyd, Thrapston Rural; Mr. Millner, Blisworth; and others; making up a total of about twenty, with the secretary (Mr. Walton Maughan).

The first stop on the tour was for the inspection of the tarvialed macadam road work now being [illegible] and on the county roads generally, but especially on those that are subject to motor-bus traffic. In Wilby village sections of tarvialed macadam which had been down for four and three years respectively without showing any appreciable sign of wear were inspected.

The party later proceeded to the North Bridge, where the county surveyor conducted them over the works and explained numerous details of this important contract. The bridge is over 300 yds. long, and the total cost will probably be in the neighbourhood of £10,000. A straight run was then made to Peterborough, and thence to the Show ground, where the party, together with those members joining at Peterborough, were entertained to luncheon by the ex-mayor, Mr. J. G. Barford, and Mr. J. E. S. Perkins, representing the well-known firm of Barford & Perkins, who had several of the latest types of motor rollers among their exhibits.

Tea was arranged for the members through the kindness of the mayoress, Lady Winfrey.

Trade Note.—Messrs. Wailes, Dove & Co., Limited, of Newcastle-on-Tyne, have applied their "Bitumastic" solution to the suction inlet and make-up pipes and other steelwork in connection with the pumping plant for the new entrance lock at Alexandra Dock, Newport, recently opened by Prince Arthur of Connaught.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference. *The Law Times.*

Talbot Cars. The Talbot total of highest awards this year now amounts to seventy, which easily exceeds their aggregate for the whole of the 1913 season. This is an exceptionally fine record when it is remembered that a considerable share of them have been won by amateur owner-drivers of Talbot cars, while the remaining wins in trade events have fallen to demonstration cars entered by the Talbot Company in accordance with their usual policy of relying exclusively upon tuned-up cars of precisely similar design to their touring chassis, whereby the Talbot successes become of relevant value in appraising the capabilities of the Talbot car for arduous road service.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. Pickering, M.I.C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. Dudley Robinson, B.Sc.(Lond.),
Secretary

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Bost, M.I.E.E., M.I.Mech.E.

COUNCIL MEETING.

At a meeting of the council held in London on 22nd July the following applicants were recommended for election:

To Membership.—Messrs. H. J. S. [illegible], surveyor, St. Ives, Hunts; Anthony Dorin, surveyor and engineer, Seaton Delaval Urban District Council; C. G. Grey, shire engineer, Abercrombie, N.S.W.; B. H. Tuck, city engineer and surveyor, Unley, South Australia; J. Hodgson, town surveyor, Kensington and Norwood, South Australia; A. D. C. [illegible], engineer, Kalgoorlie Municipality, Western Australia; W. M. Pullar, city surveyor, Essendon, Victoria; H. E. Coane, municipal consulting engineer, Melbourne; O. J. Burt, [illegible], Port Pirie Municipality, Australia; A. K. T. Sambell, municipal consulting engineer, Melbourne; F. Thompson, electrical engineer, Claremont Municipality, Western Australia; and S. T. Ford, surveyor, Camelford Rural District Council.

To Associate Membership.—Messrs. P. J. Williams, architect, Shipley Urban District Council; C. N. Butler, assistant surveyor, Tisbury Rural District Council; A. S. Northover, assistant surveyor, Tisbury Rural District Council; and S. K. Gibson, highway surveyor, Cockermouth Rural District Council.

Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within 14 days.

Elected to Studentship.—Mr. G. [illegible], surveyor's office, Ammanford Urban District Council.

New Members, &c.—From the applicants recommended for admission at the last meeting four members and three associate-members were elected, and one student was transferred to associate-membership.

Public Health Acts (Building By-laws) Amendment Bill.—The text of this bill was before the council, and it was decided to refer the matter to the General Purposes Committee for consideration and report.

Departmental Committee on Building By-laws.—This committee is prepared to receive evidence from the institution. The committee has been appointed to enquire into the working of the building by-laws, and it has been decided as a preliminary that the institution submit to the committee a memorandum embodying shortly its views. Members are requested therefore to let me have, within 21 days, any suggestions they may have to make as to present codes of by-laws, their working and administration, and so forth, and these suggestions will then be dealt with by a special committee of the institution that has been appointed to prepare the memorandum.

Nominations.—The following members were nominated by the council for the offices named: President: Mr. W. H. Matthews Jones, city engineer and surveyor, Chester; vice-presidents: Messrs. Henry C. Adams, A. R. Bleazard, Arthur Bowes, H. J. Farmer, and William Finch (re-nominated), and Messrs. John Robinson, surveyor to the Darlington Rural District Council, and Edward Whitwell, engineer and surveyor to the Abersychan Urban District Council. Hon. Treasurer: Mr. Thomas Mundy (re-nominated).

Next Council Meeting.—The next meeting of the

[illegible] will be held at London, on September, on day [illegible]

SOUTHERN & SOUTH-EASTERN DISTRICTS.

A [illegible] will be held to the South Metropolitan Gas Company's works at Tunnel [illegible] on Thursday, August 13th, at 2 p.m. to hear [illegible] the company. (Meet at [illegible] and [illegible])

EASTERN AND NORTH-EASTERN DISTRICT.

A visit will be paid to Hunstanton on August 14th, 15th and 17th.

There will be no [illegible] or other meetings, and ladies and friends of members (including female parties) are specially invited. It will form purely a trip to Hunstanton, with the opportunity for meeting, to spend in a purely friendly feeling.

G. BERSON CHIVERS,
Hon. District Secretary.

Cromer, Norfolk.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. WYAND,
Secretary.

30 Victoria-street, S.W.

Waterproofing of Cement. The flat roofs over the [illegible] to the offices of the South Manchester Guardians, Withington, have been waterproofed [illegible] with Padlo.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES. August 1st. Sedgefield Rural District Council. £110 per annum.—Mr. J. W. Lodge, clerk, Sedgefield, Ferryhill.

CHIEF ASSISTANT. August 1st. Corporation of Reigate. £150 per annum.—Mr. Jas. H. Redwood, town clerk.

SURVEYING ASSISTANT.—August 1st.—Corporation of Swansea. £120 a year.—Mr. H. Lang Coath, town clerk, Guildhall.

SURVEYOR.—August 3rd.—Faringdon Rural District Council. £120 per annum.—Mr. A. G. Hacker, clerk.

CITY SURVEYOR.—August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

BUILDING INSPECTOR.—August 5th.—Corporation of Hove. £3 per week.—Mr. H. H. Scott, borough surveyor.

ASSISTANT TO COUNTY SURVEYOR.—August 5th. Essex County Council. £200—£250.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ARCHITECTURAL ASSISTANT. August 5th. Corporation of Hove. £3 3s. per week.—Mr. H. H. Scott, borough surveyor.

WORKING FOREMAN AND STOREKEEPER. August 7th.—Corporation of Daventry.—Mr. F. Willoughby, town clerk.

DISTRICT SURVEYOR. — August 8th. — Pewsey Rural District Council. £90 per annum.—Mr. Robert Dixon, clerk.

SURVEYOR AND COLLECTOR.—August 14th.—Wapentakes and Manley Commissioners of Sewers. £150 per annum and commission.—Mr. Frank C. Hett, clerk of sewers, 11 Bigby-street, Brigg, Lincs.

COUNTY SURVEYOR.—August 19th.—Longford County Council. £250.—The Secretary, County Council Office, Longford.

CHIEF ENGINEERING ASSISTANT. — August 20th.—Corporation of Bedford. £150—£200 per annum.—Mr. N. Greenshields, borough engineer and surveyor, Town Hall, Bedford.

ASSISTANT ENGINEER. Gold Coast Government Railway. £400 per annum.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEERING DRAUGHTSMAN. Public Works Department, Government of Nigeria. £400—£500.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

COST ACCOUNTANT. Sheffield Corporation Water Department. General manager, Water Department, Town Hall, Sheffield.

TEMPORARY CLERK.—Carshalton Urban District Council.—Mr. W. W. Gale, surveyor.

HIGHWAYS FOREMAN. Hastemere Urban District Council.—Mr. A. G. Whitcher, clerk.

BURGH SURVEYOR AND SANITARY INSPECTOR.—Inverbervie Town Council. £90 per annum.—Mr. D. Nicholson, town clerk.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LONDON. September 7th. Designs for two new schools, for the London County Council. The Clerk, Spring-gardens, London, S.W.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

GILDERSOME.—Plans for twenty houses at prices from £200 to £270, for the urban district council.—Mr. W. Willey, surveyor, Council Offices.

TOTTENHAM. Designs for the erection of a school for 900 scholars, for the Tottenham Education Committee.—Mr. W. Mallinson, clerk, Education Offices, Phillip-lane, South Tottenham, N.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BROMLEY.—August 1st.—For the erection of eight cottages, for the rural district council.—Messrs. Potter & Harvey, architects, 49 London-road, Sevenoaks.

RAMSEY.—August 1st.—For the erection of twelve cottages, for the urban district council.—Mr. P. S. Bennett, surveyor.

WANTAGE.—August 3rd.—For the construction of six workmen's dwellings in three pairs, together with the construction of a sewer, house and surface-water drains, sinking a well, and erection of fencing, for the rural district council.—Mr. John W. Harris, engineer and surveyor.

STOCKPORT. August 4th. For the erection of shelters, bowling houses, and tennis pavilions, for the corporation.—Mr. J. Atkinson, borough surveyor.

WEYMOUTH.—August 4th.—For the erection of twenty-three cottages, for the corporation.—Mr. S. H. Jackson, architect, Bridge Chambers, St. Thomas-street, Weymouth.

HUDDERSFIELD.—August 4th.—For the erection of a public convenience, for the corporation.—Town Clerk.

HONLEY.—August 4th.—For widening a bridge, for the urban district council.—Messrs. J. Berry & Sons, 3 Market-place, Huddersfield.

STANLEY.—August 4th.—For the construction of an underground convenience and a storehouse, for the urban district council.—The Surveyor, Front-street.

MIDDLETON.—August 5th.—For the erection of a shelter, for the corporation.—Mr. W. Welburn, borough surveyor.

GLAMORGAN.—August 5th.—For alterations and addition to schools, for the county council.—The Architect, Metropolitan Bank Buildings, Neath.

BAILEY.—August 5th.—For extensions to the electricity station, for the corporation.—Borough Engineer.

AYLESBURY.—August 5th.—For building a generating station, for the urban district council.—Messrs. Kincaid, Waller, Manvell & Dawson, St. Stephen's House, Victoria Embankment, Westminster, S.W.

EAST GRINSTEAD.—August 5th.—For widening a culvert, for the rural district council.—Mr. C. Turton, surveyor.

BLYTH.—August 6th.—For the erection of a public convenience, stores, and workshops, for the urban district council.—Mr. R. Grieves, surveyor.

HINDLEY.—August 8th.—For the construction of a wall, fencing and gates, for the urban district council.—Mr. O. P. Abbott, surveyor.

BENTLEY.—August 10th.—For the erection of 100 houses, for the urban district council.—Mr. R. G. Whitley, surveyor.

GLASGOW.—August 10th.—For masons' and concrete work for the proposed approach to art galleries, for the corporation.—Office of Public Works, 61 Cochrane-street.

KEIGHLEY.—August 11th.—For the erection of a cemetery chapel, for the rural district council.—Mr. T. Burton, surveyor.

LITTLEHAMPTON.—August 12th.—For the erection of a public lavatory, for the rural district council.—Mr. H. Howard, surveyor, Town Offices.

EVESHAM.—August 17th.—For the erection of thirty workmen's houses, for the rural district councils of Evesham and Pebworth.—Mr. E. H. Wadams, clerk, Union Offices, Evesham.

BRISTOL.—August 18th.—For the erection of public baths, for the corporation.—Mr. I. S. McKenzie, city engineer and surveyor.

HERTS.—August 20th.—For the erection and completion of a new special subjects centre at Stevenage, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

ABERTILLERY.—August 26th.—For alterations and extensions to a school, for the Education Committee.—Mr. W. H. Haley, architect, Chapel-street, Abertillery.

Iron and Steel.

NOTTINGHAM.—August 5th.—For the supply of cast-iron pipes, specials, castings, and retort fittings, for the corporation.—Gas-works Manager, George-street, Nottingham.

FRINTON.—August 11th.—For the supply of 450 ft. of steel pipes for sea outfall sewer, for the urban district council.—Mr. E. M. Bate, surveyor.

KEIGHLEY.—September 5th.—For the supply of cylinders for reservoir works, for the corporation.—Mr. M. R. Barrett, engineer, Town Hall.

Roads.

HASTINGS.—August 3rd.—For the supply of 2,000 tons of broken granite, for the corporation.—Mr. P. H. Palmer, borough engineer.

BARKISLAND.—August 3rd.—For laying tar macadam and setting, for the urban district council.—Mr. T. Hutton, surveyor.

LISTOWEL.—August 3rd.—For the supply of a mud cart and stone-breaker, for the urban district council.—Mr. D. J. McMahon, surveyor.

CHINGFORD.—August 4th.—For making up parts of certain streets, for the urban district council.—Mr. T. J. Griffin, surveyor.

HOVE.—August 5th.—For providing and laying wood paving, for the corporation.—Borough Surveyor.

HUYTON-WITH-ROBY.—August 5th.—For paving with granite setts a part of Liverpool-road, for the urban district council.—The Surveyor.

BARNSLEY.—August 5th.—For making up two streets, for the corporation.—Mr. J. Henry Taylor, borough surveyor.

BIRKENHEAD.—August 5th.—For making up certain passages, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

ARNOLD.—August 6th.—For making up a road, for the urban district council.—Mr. R. E. Clarke, surveyor.

GLASGOW.—August 6th.—For making up certain streets, for the corporation.—Office of Public Works, 61 Cochrane-street.

WANSTEAD.—August 6th.—For widening, channelling, kerbing, and resurfacing with asphalt-macadam, for the urban district council.—The Surveyor.

STOCKPORT.—August 6th.—For making up a lane, for the corporation.—Mr. John Atkinson, borough surveyor.

MANCHESTER.—August 7th.—For paving with granited rock asphalt, for the corporation.—Surveyor to the Withington Committee, Town Hall, West Didsbury.

BUXTON.—August 7th.—For various street works, for the urban district council.—Mr. F. Langley, engineer and surveyor.

HALIFAX.—August 8th.—For constructing about 1,310 super. yds. of Durax, Kleinpflaster, or similar granite paving, for the corporation.—Mr. J. Lord, borough engineer.

DALBEATTIE.—August 8th.—For paving work with granite setts, for the corporation.—Burgh surveyor.

ALFRETON.—August 10th.—Offers for a steam roller built by Messrs. Aveling & Porter in 1895.—Mr. R. F. Ward, surveyor.

BENTLEY.—August 10th.—For making up new streets, for the urban district council.—Mr. G. Whitley, surveyor.

ROTHWELL.—August 10th.—For the supply of 5,912 super. yds. of best quality granite setts, for the urban district council.—Mr. J. Southwart, surveyor.

LONDON.—August 11th.—For paving with creosoted wood-blocks, for the county council.—Mr. G. W. Humphreys, County Hall, Spring-gardens, S.W.

GOSFORTH.—August 11th.—For forming approach roadway and erecting wood and iron netting, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

HASTINGS.—August 12th.—For laying 2,600 sq. yds. of limestone tar-paving, for the corporation.—Mr. P. H. Palmer, borough engineer.

ROCHDALE.—August 12th.—For making up certain streets, for the corporation.—Borough Surveyor.

BUNGAY.—August 14th.—For the supply of 345 tons of 1½-in. and 5 tons of 1-in. best broken granite, for the urban district council.—Mr. P. J. Sprake, clerk.

EPSOM.—August 24th.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

ALEXANDRIA.—September 1st.—For the supply of 6,500 square metres of granite or porphyry paving stones, and 350 square metres of benders, for the Ports and Lighthouses Administration of Alexandria.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Sanitary.

PORTSLADE.—August 4th.—For the construction of main surface-water sewer and outfall works, for the urban district council.—Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, S.W.

DURHAM.—August 5th.—For the construction of 185 lin. yds. of 15-in., 12-in., and 9-in. pipe sewers, manholes, ventilation columns, and street gullies, for the rural district council.—Mr. Geo. Gregson, surveyor.

HUDDERSFIELD.—August 5th.—For laying sewers in certain roads, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street.

HAILSHAM.—August 5th.—For the construction of sewers and sewage disposal works, for the rural district council.—Mr. E. Catt, clerk, 17 London-road, Hailsham.

QUEENSTOWN.—August 7th.—For the construction of an outfall sewer, for the urban district council.—Mr. P. H. McCarthy, engineer, 39 Westmorland-street, Dublin.

RUNCORN.—August 7th.—For laying steel tube, cast-iron and earthenware pipe sewers, flushing tanks, storm overflows, manholes, ventilators, sedimentation tanks, percolating filter (including reinforced concrete construction on the Kahn system), engine and pump-house, pump well, and other appurtenant works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

HUNSWORTH. [illegible] The Exchange, Bradford.

DERBYHAVEN. [illegible]

NEWPORT. [illegible] Mr. H. [illegible] engineer.

BIRMINGHAM. [illegible] Mr. Henry E. Stilgoe, city engineer and surveyor.

SOUTHAMPTON. [illegible] Mr. W. J. Parks, county surveyor, The Castle, Winchester.

FILEY. [illegible] about 16 miles of stoneware and cast-iron sewers, brick, concrete, and cast-iron manholes, flushing tanks, ventilating shafts and columns, cast-iron rising mains, air mains, engines, compressors, ejectors, and other works incidental thereto, for the urban district council.—Mr. T. J. Moss-Flower, engineer, 28 Victoria-street, Westminster, S.W.

TADCASTER. [illegible] the rural district council.—Mr. H. M. Driver, surveyor.

DENTON. [illegible] works in connection therewith, for the urban district [illegible] Mr. [illegible]

CHERTSEY. [illegible] of two circular bacterial filters, 80 ft. diameter, containing a total of 2,248 cub. yds. of destructor clinker; [illegible] the [illegible] council. Messrs. [illegible] & Brown, Burton Buildings, Parliament-street, Nottingham.

MARTLEY. [illegible] 20th.—For the construction of 2¾ miles of 9-in. and 6-in. sewers, with manholes, [illegible] filters, humus tank, sludge beds, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

RUNCORN. [illegible] 21st.—For the construction of sewers and sewage disposal works, for the rural district [illegible] Messrs. J. Dodd & Son, 14 Victoria-street, Westminster, S.W., and [illegible] Heywood, Lancashire.

DITTISHAM. [illegible] September 1st.—For the provision and laying of about 8,960 lin. yds. of cast-iron and stoneware pipe sewers, manholes, and storm-water chamber, [illegible] chamber, and tanks, and the construction of sedimentation tanks, percolating filters, humus tanks, sludge beds, channels, and diversion of stream course, for the urban district council.—Mr. L. Kenyon, engineer, Council Offices.

ALEXANDRIA.—December 8th.—For the construction of a [illegible] system, for the [illegible] Mr. [illegible] Clerk, Municipal Offices, Alexandria.

Miscellaneous.

TWICKENHAM.—August 12th.—For the supply of a 400-450 gallon petrol motor fire engine, complete with pump, 50-ft. fire escape, and first-aid equipment, for the urban district council.—Mr. F. W. Pearce, engineer and surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance
‡ Provisionally accepted.

ABERGAVENNY.—For road improvement and sewerage, for the urban district council.—Mr. L. Whitwell, surveyor.

J. R. Davies, Newport*	£369
J. Watkins, Abergavenny	339
W. Brannon, Abergavenny	323
G. Morgan, Pontypool	307
H. Rees, Abergavenny	264
W. Webb, Abergavenny	252
J. C. Lane	242

Surveyor's estimate, £248.

CAMBRIDGE.—For the erection of a school, for the corporation:—

Jells Brothers, Letchworth	£2,982
H. E. Ambrose, Cambridge	2,853
W. Bull & Sons, Cambridge	2,779
Blackmore Brothers, Wellingborough	2,777
G. Henson & Son, Wellingborough	2,730
Patten & Sons, Hunts	2,693
Clark & Sons, Cambridge	2,690
Kitson & Sons, Cambridge	2,574
Coulson & Lotts, Cambridge	2,560
P. Rocke & Sons, Cambridge	2,555
J. Bridgell, Cambridge	2,550
J. E. Lovell & Sons, Cambridge	2,538

LEYBURN.—For laying sewers and constructing sewage disposal works, for the rural district council.—Mr. F. J. Bedwell, engineer, 7 and 8, Prudential Assurance Buildings, Park-row, Leeds.

Kaye Brothers, Huddersfield	£2,374
M. Arundel, East Ardsley	2,242
R. May, Leyburn	2,180
C. Brisby & Sons, Leeds	2,142
A. Schofield, Leeds*	2,100
J. B. Thetlewaite, Leyburn	2,011

LLANDAFF.—For work of road widening, for the rural district council.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

T. Evans, Cardiff	£240
Hatherley & Co., Penarth	222
T. Bassetter, Caerphilly	188
J. Harry, Radyr	172
C. Davies, Cardiff	164
S. Hewlett, Cardiff	157
L. Rees, Whitechurch	155

NEWARK.—For the erection of handicraft and domestic centres, for the Education Committee.—Mr. H. W. Lockton, architect, Newark:—

G. Brown & Son, Newark, £1,198.

RAWTENSTALL.—Accepted for the construction of sewers and manholes, for the corporation.—Mr. J. Johnson, borough engineer.

W. Heaton, Bacup.

ROMFORD.—For the construction of stoneware pipe sewers and road work, for the rural district council.—Mr. W. J. Grant, 15a South-street, Romford.

SEALLS, HAROLD WOOD.

W. Jackson, Forest Gate	£415
W. Lingwood, junr., Romford	381
B. H. Hall, Romford	339
Crabtree & Beesley, Romford	333
F. W. Moss, Romford	323

Surveyor's estimate, £341.

BALGORES LANE SEWER, HORNCHURCH.

T. W. Moss, Romford	£80
W. Jackson, Forest Gate	77
B. H. Hall, Romford	77
F. G. Kelley, Romford	75
W. Lingwood, junr., Romford*	75

Surveyor's estimate, £90.

ROTHERHAM.—Accepted for laying stoneware pipe sewer, for the rural district council.—Mr. B. Hey, engineer, Imperial Buildings.

W. H. Treherne, Limited, Rotherham, £105.

RUISLIP-NORTHWOOD.—For making up part of Dene-road, Northwood (about 260 yds.), for the urban district council.—Mr. W. L. Carr, surveyor:—

Dodd & Co., Hendon	£1,367
Clements Knowling & Co., Brentford	1,047
H. Farrow, Brixton	1,032
Road Maintenance and Stone Supply Company, Limited, Cannon-street	1,024
A. Wooster, Wealdstone	997
Pilgrim & Sons, Limited, Whetstone	947
L. Free & Sons, Maidenhead	929
Willis & Powis, Wembley	909
M. Thacker, Westminster	890
W. & C. Hampton, Palmers Green*	880

RUISLIP-NORTHWOOD.—For making up Hillhard-road, Northwood (about 600 yds.), for the urban district council.—Mr. W. L. Carr, surveyor:—

Dodd & Co., Hendon	£2,641
Road Maintenance and Stone Supply Company, Limited, Cannon-street	2,039
Pilgrim & Sons, Limited, Whetstone	1,929
H. Farrow, Brixton	1,891
L. Free & Sons, Maidenhead	1,888
A. Wooster, Wealdstone	1,879
Clements Knowling & Co., Limited, Brentford	1,877
M. Thacker, Westminster	1,788
Willis & Powis, Wembley	1,766
W. & C. Hampton, Palmers Green	1,750

WANDSWORTH.—For wood paving and other works in Streatham High-road and Streatham-hill, for the borough council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.:—

W. Griffiths & Co., Limited, £2,860, and schedule prices for extras and omissions.†

WELLINGTON.—For the supply of tarred macadam and broken granite, for the urban district council.—Mr. G. Riley, surveyor:—

TARRED MACADAM.

Pyx Granite Company, Horsehay, Salop.*—2½-in., 13s. 10d. per ton; ½-in., 14s. 10d. per ton.

Ceiriog Granite Company, Chirk, North Wales.—2½-in., 14s. 4d. per ton; ½-in., 15s. per ton.

Arenig Granite Company, Shrewsbury.—2½-in., 14s. 3d. per ton; ½-in., 14s. 3d. per ton.

BROKEN GRANITE.

Pyx Granite Company, Horsehay, Salop.*—2½-in., 8s. 4d. per ton.

Arenig Granite Company, Shrewsbury.—2½-in., 8s. 11d. per ton.

Ceiriog Granite Company, Chirk, North Wales.—2½-in., 8s. 7d. per ton.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. AUGUST 7, 1914. No. 1,177.

Minutes of Proceedings.

The Edges of Road Crusts.

One of the most important of the advances made during recent years in the science of road making consists in the recognition of the fact that the edges of road crusts need to be properly designed. It has to a great extent been the practice to make road crusts which peter out at the edges, this being a survival from a method of road making which consisted in the gravelling or metalling of a humped road bed, raised above the level of the ground, and intended for traffic along the middle only. As a result of the lack of attention to the conditions at the edges of the crust, many of our country roads have been, and still are, badly rutted near the edges, or ground up by progressive cutting back from the edges towards the middle. In other cases the quantity of road metal applied near the edges has been considerable, or even very large, and some of it has been squeezed into the raised turf margins, or into the banks of narrow lanes, giving, in a rough fashion, some measure of lateral support, and even some extra thickness of crust near the edges. But variations in the amount of metal applied per yard have caused initial undulation, or varying degrees of support leading to undulation, and the wavy character of many road margins, accentuated by surface drainage, is a marked feature on many roads. Well-designed roads, such as those made some decades ago in certain German States, and the still earlier roads of Trésaguet, were often provided with border stones, the surfaces of which were sometimes flush with a raised margin, but more often flush with the surface of the roadway. Such supports have an excellent effect during the construction of the road crust, and the border stone which is flush with the surface of the road plays a useful part in spreading wheel loads lengthwise with the road, and so reducing the shearing effect at the edges. Such border stones are now sometimes called "abutments," but it is important to observe that they are not comparable in their functions with the abutments of bridges. This was fully explained, with numerical calculations, in an article which appeared in THE SURVEYOR some little time ago—a criticism of certain observations made by an American engineer. Considering a road crust as an arch, we find that its thrust is very great indeed, much too great to be taken up by border stones acting as abutments, and requiring a very strong beam resting against solid soil, or massive masonry abutments.

What is really needed at the edges of the crust is to give as much vertical support as is provided in the middle of the road, and to spread each wheel load no less. The subject was ably presented at the second Irish Road Congress by Mr. Reginald Ryves, who specially advocated methods involving the carrying of the crust beyond the normal incidence of wheel loads,* taking it right under a raised margin or into a bank, or so incorporating it with a virtual crust beyond the visual edge of the carriageway that the strip of crust beyond the incidence of wheel loads would be wide enough to allow of the full spread of the load upon the subsoil. This method not only spreads wheel loads, but it also prevents the chipping away of the edges of the crust. Increased depth alone, as provided by Mr. Arthur Gladwell's trenching method, has certain advantages, and though it does not wholly prevent chipping of the edges, it spreads the load fore and aft, and so reduces the pressure upon the subsoil. To obtain an even more definite and certain spread of the load fore and aft, Mr. A. Dryland, M.INST.C.E., county surveyor of Surrey, is adopting a continuous concrete border stone, which he lightly reinforces, this method being described in an interesting note which he contributed to our issue of last week, p. 166. The drawbacks to this design seem to be: First, that there is not adequate protection of the outer edge of the concrete; and, secondly, that the vertical surface between the concrete and the crust proper substitutes friction merely for the normal cone effect, and so destroys vertical support. The method is very effective in reducing the load upon the subsoil when a wheel is at the edge and rests on the border stone (or, in this case, concrete beam), but the reduction of the pressure on the subsoil is much less when the wheel is close to the beam, but does not rest on it. There is then no increased spread of the load fore and aft, and, owing to the interposition of the beam, the spread outward is suddenly reduced. This difficulty might be overcome by an alteration in the design, but even then the sudden change to a material with a different modulus of elasticity, different hardness, and very different degree of resistance with respect to load distribution is a drawback inherent in the method. In cases in which marginal traffic is small in amount, though severe in character, it may, however, prove to be very useful. To provide against the actual crushing down of the edge of the crust is sometimes an important matter, and Mr. Dryland is to be congratulated upon his practical application of the principle of fore and aft distribution of wheel loads, combined with the prevention of lateral creep of the crust. Mr. Dryland thinks that some surveyors might prefer to use a thicker and deeper beam, but, although we think this likely, we are inclined also to consider the advantages of somewhat stronger reinforcement, so that the efficiency of the edging as a vertical and lateral beam may be amply secured.

* See THE SURVEYOR, Sept. 8, 1911.

Road Foundations on Clay Soils.

It would be hardly too much to say that the idea that stiff clay can be drained by pipes is one of the most fertile sources of those failures which render road making and maintenance so much more costly than need be. The spacing of drains under a road crust must usually be much less than is supposed to be necessary, if the drains are to be really effective; and in the case of a clay soil, in which the hydraulic gradient approaches 90 degrees, the space between the drains is reduced to nothing. This means that we need a continuous drainage layer, which may also be a part of the strength crust, and is usually either a Telford pavement or hand-packed rubble of stones differing much in size, but not continuously graded. Our readers will be interested to learn from a perusal of the article contributed to the present issue by Mr. G. H. Jack, county surveyor of Hereford—that this method of bottoming roads on clay soils has been adopted in that county, which, as we have more than once observed, is specially deserving of Road Board contributions on account of the troublesome nature of its clayey and silty subsoils. Attempts to provide drainage by means of pipes laid in rubble proved a failure, for the reason we have indicated above; but it may safely be predicted that the method which Mr. Jack has now adopted will prove successful, and his description thereof may be commended to the notice of surveyors who are faced with similar difficulties.

* * *

New York Water Purification Project Killed.

After hearing so much of the great works for the water supply of New York, constructed at enormous expenditure, and providing for a prospective population estimated upon the most liberal basis, it comes as somewhat of a surprise to find the American Waterworks Association considering the very unsatisfactory quality of the water supplied, and lamenting the fact that a project for the purification of the water which has been ten years under consideration has been finally abandoned. Mr. George W. Fuller, in a recent paper dealing with this question, draws attention to the impure quality of the Croton supply. It appears that the water is polluted, that its colour is high, and that a bad odour is at all times perceptible, and sometimes very marked. There are troubles from microscopic growths. The best that could be said for it by the commission employed to investigate the matter in 1913 was that the water is reasonably safe, "except possibly for short intervals, as indicated by the typhoid outbreak of 1907." A water which is believed to be subject to pollution of this kind for short intervals is obviously unfit for human consumption, and it is not to be wondered at that various property owners are required to treat the water supplied to them by the City of New York, that the hotels and apartment houses and many private residences and office buildings have to filter their water, while the large trade in bottled water for drinking purposes results in an outlay of money which would more than pay for the operation, cost and maintenance of purification plant to serve the whole city.

It may be urged that this condemnation applies only to the Croton supply, whereas the New Catskill aqueduct will provide water of better quality; but apparently this is not so. Mr. Fuller points out that some study was given to the possible effect of the use of the Catskill supply in times of high turbidity as a substitute for the Croton, and that the indications are that the Catskill supply will at such times be no better than the Croton water. We are further told that reliance is placed upon treatment with hypochlorite, which is without doubt unsuitable to water containing much organic matter. If sufficient hypochlorite is added to destroy the organic matter and to leave an excess sufficient to destroy the micro-organisms there must be an unpleasant taste and odour. If not the treatment is insufficient to deal with the micro-organisms. In spite of all that has been said and written upon this subject to the effect that such treatment is only suitable for clear water, or for filtered water, we still hear continually of the foolish practice of trying to sterilise water with a high organic content with hypochlorite. It is, however, a matter of surprise to find the city of New York deciding to continue the use of this system in the face of the advice of all the engineers and water experts who have reported again and again in favour of better treatment. Mr. Fuller emphasises that it is "even more curious that the same officials who had voted to give New York a proper drinking water should later, with the same information before them, reverse themselves; that a board of aldermen, who but a short time before were considering a vote of censure on the executive department for their slowness in providing filtered water, should a few months later repeal their ordinance and condemn the project; that the newspapers, which had just stopped printing attacks on the city officers for their negligence in providing bad water, should write to oppose the so-called steal when they were about to receive their demands."

Mr. Fuller's paper forms interesting reading not only as regards the details of a very interesting scheme for water purification, but as showing how a great project, apparently of a most urgent character, may be killed by opposition in the face of all expert advice. It suggests that we here see on a large scale how a purely engineering matter is often settled by laymen in the face of all qualified advice. In a more enlightened age it is to be imagined that it will be as impossible for the lay official, alderman or councillor to deal with engineering matters against the advice of the engineer as it would now be for them to deal with legal matters against the advice of the lawyer, or with medical matters against the advice of the doctor.

* * *

War and the Engineer.

When we read of an attempt made by an innkeeper and his son to destroy a tunnel, and of another person endeavouring to poison wells, as early incidents in the war between France and Germany, the idea that we should do well to guard ourselves against the possibility of injury to our municipal works at once suggests itself. It is needless to take an alarmist view; on the other hand it is wise, as a correspondent makes clear in a letter which we print elsewhere in this issue, to be fully prepared for the fortunes of war. The municipal engineer has at all times a great responsibility, but in time of war this responsibility is surely increased. To consider one of the many works for which he is responsible—the water supply. The greater the work, the greater is its vulnerability; one man with a spade could easily start a burst in an earthen dam, and one small cartridge might wreck the conduit which supplies a city. How soon might the most perfect pumping machinery be put out of gear or utterly ruined. Again, one may imagine how easily a great sewer might be blocked or even wrecked, and how seriously this might, under certain conditions, affect the district served. The same applies to power and electricity stations, to bridges and to docks. In the case of dock basins the malicious bursting of a wall might easily lead to the wrecking of a large number of vessels, while injury to dock gates and caissons would be followed by the most serious consequences. It is idle to enumerate or to suggest the various ways in which

harm might be done; every engineer knows only too well how easily the greatest works could be injured or wrecked, seeing that they have been designed and constructed for the purposes of peace, and not to withstand malicious attack.

Bearing these facts in mind it is clearly the duty of the municipal engineer at the present time to take every possible precaution against the possibilities mentioned. Reservoirs certainly ought to be watched and guarded where the supply of large communities is dependent upon them; similarly long exposed pipe lines ought to be watched. At present it would not be difficult for our country's enemies to damage aqueducts or reservoirs. It is a case in which the municipal engineer should carefully consider what works under his control are sufficiently important and vulnerable to require special guarding, and next he would do well to see that they are efficiently watched. If his own staff of workmen are insufficient, as may well be the case, it is his duty to call attention to the fact, and the help of the police, military, and territorials may well be required. There will be a very large number of persons ready and willing to serve their country at the present time. These might be employed in guarding municipal works, but such service will be useless unless it is first directed by the municipal engineer. There are other dangers incident to a state of war. The bridges and highways may need special protection. Excessive loads may come upon them, and it is the duty of the municipal engineer to see that these are strong enough to sustain the loads, and where necessary to make provision for temporarily strengthening them. We do not wish to adopt any alarmist attitude; happily the risk of actual invasion is extremely remote. There are, nevertheless, other chances of trouble which should not be overlooked, and the proper guarding of municipal works at the present time is a duty which should be brought prominently forward, seeing how vitally the well-being of every citizen is affected.

* * *

Fishing in Public Reservoirs. Whether it is desirable that the public should have access to our reservoirs, or whether the reverse is the case, it is well to take into account the fact that a large number of water authorities provide angling for their ratepayers by making use of the waters from which the town supplies are drawn. Mr. Ernest Phillips, in his book upon "Trout in Lakes and Reservoirs," a review of which appears on page 211, states that there are over sixty municipal or urban authorities who are following this course. Further, he gives a list of over 150 reservoirs used for fishing purposes, and it is to be noted that day tickets and season tickets are issued in many cases. Mr. Phillips quotes, as an illustration, the case of Sheffield, which possesses an angling association with a roll of 20,000 paying members. Here the corporation have acquired the fishing in one of the reservoirs. It is not to be inferred that this particular reservoir is polluted; but when one considers the very large number of anglers—if Sheffield is to be taken as typical—and the growing practice of permitting persons to fish in reservoirs used for the storage of drinking water, it is clear that the practice is one which ought to receive very careful attention as regards the possibilities of water pollution.

Where fishing is allowed in any reservoir there must necessarily exist some chance of contamination. In the first place the baits freely used at certain reservoirs are worms and gentles. There are also possibilities of ground bait of an unpleasant character being thrown into the water in fairly large quantities. But a far greater danger naturally exists from the possibility of the excretions from persons fishing during a long day entering the water. It is, for instance, quite possible that a typhoid carrier might thus pollute the water near the outlet of a reservoir. Purification by storage plus the enormous dilution which is likely to take place may, and probably do, render the water safe. It would, however, be interesting to hear what the bacteriologist has to say on the point. Dr. Houston, for instance, tells us that "if a typhoid carrier micturated in the river above the intakes (say from a boat), the typhoid germs, in the absence of storage, would be carried directly on to the filters, with consequences which could hardly be other than calamitous." Dr. Houston would safeguard the river water by large storage in reservoirs because it is subject to such pollution, which he considers more serious than any other, for he says. "Even if water is polluted with as much as from 0·001 to 0·0001 per cent of crude sewage, the chances of typhoid bacilli being uniformly present are extremely remote . . . but a water polluted with extremely small traces of typhoid urine would probably suffice to produce a serious epidemic." How, then, stands the case with those reservoirs from which the corporation or water authority derive an income due to the sale of tickets to anglers, or where fishing from boats is permitted? Is it possible to prevent such contamination as that against which Dr. Houston has warned us? It is impossible to read of the large number of reservoirs, including those of our greatest towns where fishing is encouraged, without fearing that a grave risk is being taken, a risk which is likely to become greater as the number of anglers increases. Stringent precautions ought to be taken in any case, and in no case should fishing be permitted against the advice of the bacteriologist, whose opinion ought to be obtained as a preliminary measure.

* * *

National Health Week. The institution of a National Health Week some two years ago at the instance of the Agenda Club received our cordial support at the time, owing to our belief in the value of educational propaganda as an aid to the practical work of public health administration. Health departments and voluntary agencies have come to realise that the principal foes against which they have to fight are the twin demons of apathy and ignorance. In this connection the value of Health Week is twofold. In the first place it means an annual organised attempt to shed the light of knowledge in places where it has not penetrated hitherto; and, in the second place, it tends to produce a spirit of co-operation between the various voluntary societies and public bodies, which are all working with the same object in view. The second celebration of Health Week, which took place last year, showed that the movement was receiving even greater and more widespread support than was the case in the year of its inauguration, and there can be no doubt that the present year will witness further developments. The fact that the arrangements are in the hands of the Royal Sanitary Institute is in itself a great thing, and, coupled with the consent of the Lord Mayor of London to act as chairman of the General Committee, should go far to insure success. Further, it is announced that a letter has been received from the President of the Local Government Board stating that the board would be prepared to consider applications from sanitary authorities whose accounts are subject to audit by the district auditors for sanction to reasonable expenditure in connection with the holding of a Health Week in their districts this year. This official recognition of the advantages to be gained should secure the inauguration of a celebration of Health Week in many districts which have hitherto held aloof.

Sub-Crust Movement in Roads Subject to Heavy Mechanical Traffic.

By G. H. JACK, County Surveyor, Herefordshire

I was [illegible] to be present at the Cheltenham meeting of Municipal Engineers. I have read with interest the paper [illegible] in the [illegible] the county [illegible]

In this county with [illegible] of [illegible] and the crushed Clee Hill [illegible] on the soil and [illegible] during the wettest months [illegible] are quite satisfactory, and that all tendency to spread ceases.

Until recent years there were some stretches of road which could not be satisfactorily maintained without [illegible] the entire reconstruction.

During the winter the centre was pressed down by heavy traffic so that the crown instead of being convex was concave, and the ditches were squeezed out of existence; the obstruction accentuated the general trouble and caused the roadsides to be thoroughly sodden and yielding to even light traffic. The annual loss of metalling on such roads was enormous, and I have found unworn Clee Hill stone embedded in the clay 2 ft. below the surface. Fig. 1 shows such a road after the haulage by traction engine of 3,690 tons of material over it during a period of seven months. Prior to the haulage the road presented a good appearance.

Fig. 1.—Hereford-Shrewsbury Road Destroyed by Engine owing to Instability of the Subsoil.

It appears to me that, provided reinforced frames were placed on such a road, the necessity for reconstruction would remain.

The mixture of clay and stone would be still unstable. The character of the subsoil under the roads with which I am dealing varies considerably; there are no two miles alike. In some cases the subsoil for the full width is of a yielding nature; in other cases the sides only are weak, and in others there are weak areas varying from 1 to 50 sq. yds.

Briefly, the method I am adopting is to remove all the soft material and replace it with large sized hand-packed stones, 6 to 18 in. in size. Fig. 2 shows such material in use on roads for the full width.

Fig. 2.—Hereford-Brecon Road: Heavy Foundation Work in Progress.

to be readily squeezed out of shape by heavy mechanical traffic. Mr. Sinnott has contended that exaggerated the extent of the movement of the subsoil in such roads. Experiments were made in the county to arrest the downward spreading of the road by digging out the softest clay beds and pitching the [illegible] with [illegible] stone, but the work was not sufficiently extensive, and the result was a [illegible] waste of valuable surfacing material. To tar-paint such roads, or to have employed costly tarred material, would have been a sheer waste of money. It was not until the Road Board came into existence that the work could be tackled in a scientific and extensive manner. Twenty-two miles of road are now in process of reconstruction. The surfacing work is straightforward and easy to accomplish. It is the foundation work which takes up the bulk of our time and money. In my opinion this wholesale strengthening of weak roads with local materials not only solves the problem of movement in sub-crusts, but also provides a perfect foundation upon which may rest the expensive surfacing materials now in vogue.

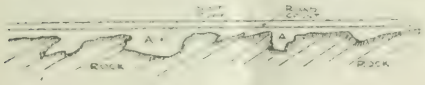
This article is intended to give some idea of the methods adopted in this county, and not so much a criticism of Mr. Sinnott's methods. I would not attempt to dilate upon the merits of the reinforced frames without the experience of their behaviour in practice. I can say, however, that roads treated in the manner indicated by the illustrations The roads are treated half width at a time to facilitate the traffic. Fig. 3 shows a road being strengthened at the sides only (Hereford and Gloucester road). At intervals stone drains are laid from the bottom of the foundation to a convenient and

clear outlet. Some of Mr. Sunnott's critics suggest that proper drainage would get rid of the whole trouble. This is not so. I thought so at one time, and spent a good deal of money in laying agricultural pipes in rubble trenches, but the result was rather disappointing. The reason the drain failed to a complete success lies in the fact of the clay being so dense that the passage of the water to the drains is much too slow a process.

Fig. 3. Hereford-Gloucester Road. Strengthening of Weak Sides.

The greatest difficulty has been experienced on roads cut along hillsides and in cases where the rock lies from 1 ft. to 2 ft. below the surface.

A longitudinal section of such a road is given



The clay in the pockets at AA is very soft, and until it is entirely removed it is impossible to be sure of the good job being made. Fig. 4 shows the filling of such places with large local stone. The road over this construction is made absolutely rigid. In every case the foundation material is carried well under the road, as shown on Fig. 5. This prevents the displacement of the edging by heavy vehicles along the sides of the roads. The cost per mile would be misleading, for the reason that no two roads bear any resemblance in regard cost. The cost per square yard, consolidated and surface-bound, and left quite smooth for use by motors, with the tarred surface in approved, works out as follows: 2½ in. 6 4s. 8d.; 1 in. thick, 3s. 8d.; 6 in. thick, 1s. 8d.

I do not claim anything new in the methods I have described; at the same time, the fact of being sure of the road foundations before finally surfaced, are not as even now not a common procedure. I have often been surprised to hear of miles of tarred surface being laid down upon roads which were as weak as they could be. There can be no real economies effected in the maintenance of road surfaces until the foundations are sufficiently rigid to keep the surface in proper shape. Once this is attained surfacing with bituminous materials is simple and efficient.

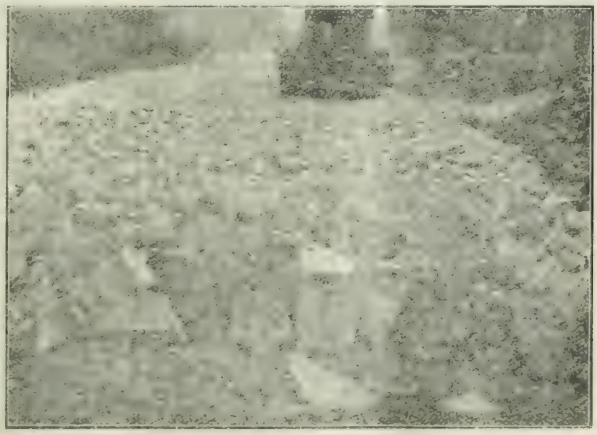


Fig. 4. Hereford-Shrewsbury Road. Special Work in Places where Clay has been Removed from "Pockets" (A.A. on Sketch).

DEATH OF MR. JOHN WAINWRIGHT.

Mr. John Charles Rawlinson Wainwright, of John Wainwright & Co., Limited, Shepton Mallet and London, died, we regret to state, on July 29th, aged fifty-five, after a severe illness of several weeks.

Mr. Wainwright was in many respects a remarkable man. Rising superior to physical infirmities caused by a severe illness in his early years, he was instrumental in establishing the cattle market at Shepton Mallet, and in developing the stone trade of the district. By the introduction of new methods, he was able to convert the Moon's Hill quarry into a paying concern, and he also became interested in colliery enterprise at Newlands. His tarred stone and asphalt works proved highly prosperous concerns, and basaltic concrete slab paving was one of his specialities. In social life he was greatly esteemed, and much sympathy is felt for his widow.

The funeral took place on July 28th at Shepton Mallet cemetery, and was attended by nearly a hundred persons, including the deceased's business associates and railway and commercial representatives.

Deal's Proposed Marine Pavilion.—Sanction was refused on the 29th ult. by a committee of the House of Lords, presided over by Lord Haversham, to a Bill which had been passed by the House of Commons) to authorise the corporation of Deal to construct on the sea-front, about midway between the pier and the castle, a pavilion in which musical and other entertainments could be given.

Proposed Town Planning Scheme for Wallsend. Mr. S. F. Popley, Local Government Board inspector, officiated at an inquiry on Tuesday week into an application by the Wallsend Corporation for sanction to prepare a town planning scheme in an area consisting of 1,110 acres on the north of the town. The borough surveyor, Mr. George Hollings, stated that under the proposed scheme the council would be better able to arrange for through roads, and would be able to control the number of dwellings to the acre. On that point they hoped to confer with the landowners.

CLASSIFICATION OF ROADS.

COUNTY COUNCILS ASSOCIATION COMMITTEE'S REPORT.

At the last meeting of the Executive Council of the County Councils Association the Highways Committee reported that a recommendation on the question of the classification of roads had been considered and the following resolution passed:

(*a*) That the expression "main road" should be abolished, and the existing law relating to highways should be amended in accordance with the suggestions contained in the following paragraphs:—

FIRST-CLASS ROADS.

(*b*) That a borough or urban district having a population of not less than 10,000 should have power to claim to retain any first-class roads within their areas, and in such case such roads should for all highway purposes be vested in the borough or urban district council, and should be called first-class borough roads or first-class district roads, as the case may be. Provided that any borough or district council which has claimed to retain a road should have power subsequently to surrender such road to the county council whenever they may think fit.

Fig. 5.—Herleford-Shrewsbury Road: Foundation Material Carried to Side Ditches; New Edging in Process of Formation.

(*c*) That all other first-class roads should be known as first-class county roads, and should for all highway purposes be vested in the county council.

(*d*) That half of the approved annual expenditure (including any annual charge in respect of loans) on maintenance of all first-class roads should be paid by the Exchequer and half by the county council; but the county council should not be liable to pay half the cost in the case of a borough or district road unless the county surveyor has certified that it has been efficiently maintained.

(*e*) That the county council should have power to contribute to the expenditure of any first-class borough or district road in addition to the half cost of maintenance.

SECOND-CLASS ROADS.

(*f*) That, except as is hereinafter provided, all second-class roads should, for all highway purposes, be vested in the borough or urban or rural district council, and should be called second-class borough or district roads.

(*g*) That a county council should have power to claim to retain any second-class roads which were main roads before the passing of the Act, and that a borough or district council should have power by agreement to surrender to the county council any second-class road within their area. Any such roads should be vested in the county council, and should for all highway purposes be known as second-class or county roads.

(*h*) That the cost of maintenance of second-class roads should be paid in the case of borough or district roads (not vested in the county council) as to ¼ by the Exchequer, ½ by the county council, and ½ by the borough or district council, subject to provisions as regards efficient maintenance, as in the case of first-class roads, and in the case of county roads (vested in the county council), as to ¼ by the Exchequer and ¾ by the county council.

(*i*) That the county council should have power to contribute to the expenditure which they may approve on any second-class road, in addition to their legal liability.

THIRD-CLASS ROADS.

(*j*) That the borough or district councils should be solely responsible for the third-class roads within their area, and such roads should for all highway purposes be vested in them, provided that they should have power by agreement to contract with the county council for their maintenance. Provided also that a county council should have power to claim to retain any third-class roads which were main roads before the passing of the Act, and that a borough or district council should have power by agreement to surrender to the county council any third-class road within their area, and that in any such case the county council should be responsible for the entire cost of such roads, and the roads should for all highway purposes be vested in the county council.

BRIDGES.

(*k*) That any bridge vested in a highway authority, together with the roadway and approaches thereto, should, for the purpose of Government grants, be treated as part of the highway of which it is a continuation.

PAYMENT OF GRANTS.

(*l*) That all Exchequer grants in respect of first-class roads should be paid to the county council, and in respect of other roads to the authority in which the road is vested, and payments should be made on account during the twelve months, but leaving a sufficient margin to enable the Road Board to ensure generally efficient maintenance.

PIPES IN MAIN ROADS.

NEW DECISION BY A SELECT COMMITTEE.

A novel point arose last week before a Select Committee of the House of Commons, presided over by Mr. Lane Fox, which had under consideration a Bill to provide Weston-super-Mare with an improved water supply.

The Somersetshire County Council wanted the insertion of a clause providing that when it was necessary to alter the level or improve main roads any additional cost arising because of the necessity for moving the pipes of the Weston-super-Mare District Council should be borne by the district council and not by the Somerset County Council. It was pointed out that the county council had a public duty to perform in respect of the roads, and it was only fair, in the event of the urban district council's pipes causing any additional expense, that it should fall on the district council, and not be borne by the county council.

The district council, while admitting this fair in the case of bridges belonging to the county council, objected to it in regard to main roads, which had to be improved to meet the weightier traffic. It was contended that it was an attempt to put part of the burden which should be borne by the county council upon the district council.

The committee unanimously decided to insert a provision as asked by the county council.

This is the first time such a decision has been given in respect of water mains.

Carbis Bay (Cornwall) Water Supply.—A water company is about to be formed for the purpose of supplying Carbis Bay and Lelant, including the celebrated golf links, with a permanent water supply. Mr. A. P. I. Cotterell, M.Inst.C.E., of Westminster, is the engineer.

The Croton Water Supply.

THE QUALITY AND PURIFICATION.

That the ten-year-long attempt to give the citizens of New York a drinking water supply of a quality such as is elsewhere demanded should have proved abortive, the causes, the possibilities and much interesting comment are the subjects of a paper written by Mr. George W. Fuller, and published in the "Journal" of the American Waterworks Association.

The author describes his paper as one upon a dead project, but he considers this a matter of such significance as to merit a full description.

QUALITY OF WATER SUPPLIED TO NEW YORK.

The water supplied from the Croton reservoir is gathered from a watershed containing much swampy land. The colour is frequently high, odour is perceptible and sometimes very marked. Microscopic growths give the water a distinct taste, sometimes very disagreeable. The watershed is inhabited by 25,000 persons, whose sewage eventually reaches the reservoirs; a very small part of the population is provided with sewage disposal works. The sewage from passenger trains passing along 13 miles of railroad track within 300 ft. of the flow line, and along eighteen railroad bridges, aggregating 1,700 feet in length, enters the reservoirs practically raw. Highway bridges, nineteen in number, aggregating 4,200 ft. in length, discharge their wash into the reservoirs. Wash from roads and run-off from farm lands, and the existence of some 24 square miles of swampy land on the watershed cause at times a heavy turbidity, and "at all times a marked colour, bad odour and taste." The official records show that in times of flood the storage in the Croton Lake is only sufficient to provide for a retention of the water flowing therein for from ten days to fifteen days, and as the time required for the water to flow through the aqueduct from Croton Lake to New York may be measured in hours, the period of detention in times of flood is not sufficient to give security against the introduction of infected water to New York, provided infection exists in the watershed.

WATER OF AVERAGE QUALITY.

The author, however, prefaces his remarks with the words: "The Croton water on average is of fair quality." We are also told that "a high typhoid death-rate shows generally a dangerous water; a low rate, such as ours in New York, shows a water of safe average quality." Seeing, however, that there are "numbers of property owners who are now required to filter, or otherwise treat, the water supplied to them by the City of New York," that "the great majority of hotels and some apartment houses, as well as many private residences and office buildings, resort to local filtration of the Croton water," and that "the purchase of bottled water for drinking purposes" is "a practice which is very common," it seems that the typhoid rate may be affected beneficially in some degree thereby; that the official figures may be somewhat misleading, and that there is, after all, something seriously amiss with this water of "safe average quality."

PRESENT TREATMENT.

Copper sulphate is applied to the water in the reservoirs in order to reduce the microscopic vegetable growths, and the water on reaching the city is treated with hypochlorite, and the grosser sources of pollution in the watershed are individually treated. But, as is well known, such treatment with hypochlorite can only be successfully applied to clear or filtered water. "When applied to raw water with an appreciable organic content, larger doses must be used because enough must be applied to combine with the organic and other matters in the water which are capable of rapid oxidation in its presence, and still leave enough excess to perform its germicidal function. The amount of organic matters in many waters fluctuates rapidly from day to day, and even from hour to hour, and the difficulties of regulating the dose of hypochlorite to meet these fluctuations probably accounts for the incomplete sterilisation of raw water."

Such are the words of the majority report of the commission employed to investigate the matter in 1913. The report also states that the typhoid from statistics indicate that the Croton water is reasonably safe, "except possibly for short intervals, as indicated by the typhoid outbreak of 1907." Then short intervals of typhoid surely suggest that the water is of unsafe quality. Mr. Fuller sums up the situation in the following words: "Real safety we are not getting. Limited by the need of adding only enough hypochlorite not to spoil the taste, and with an organic content in the water varying from day to day, it is not physically possible closely to vary the hypochlorite dose so as to oxidise both the organic matter and the bacterial content and leave no objectionable excess."

SAND FILTERS AND MECHANICAL FILTERS.

In the year 1907 Messrs. Herring & Fuller carried out an investigation which resulted in a recommendation to build 12 acres of slow sand filters, and to employ coagulation during eight months of the year. Later, in 1911, a thorough investigation of the relative merits of slow sand filters, both with and without coagulant, and of mechanical filters was made. Comparative estimates of cost were also prepared. It was shown that, while either of the three types of filter would produce uniformly satisfactory results as to freedom from bacteria and obnoxious odours, plain sand filtration would not remove the turbidity and colour in the Croton water at all times, and that, following the very heavy rains, the effluent of the sand filters would show excessive turbidity. On the other hand it was possible to obtain at all times a fully satisfactory grade of filtered water by either the modified sand filter method or by mechanical filters. So far as quality was concerned, there would be no choice between these two methods, viz., slow sand filters with coagulation and mechanical filtration. When, however, costs were compared, mechanical filters showed a saving of first cost of $3,500,000, and an annual saving of $138,000.

These plans and estimates were then submitted to a consulting board of experts in 1912, who reported favourably upon the scheme, which was as follows:—

WATER PURIFICATION SCHEME.

The raw water might or might not be aërated. This point was left unsettled. Aluminium sulphate was to be used for coagulation, and lime or soda were to be used to neutralise excess carbonic acid in the filtered water. Sterilisation was to be effected by the addition of from ·5 to 1 part per 1,000,000 of hypochlorite to the filtered water.

RUST TROUBLES.

Much study was given to the question of rust trouble. "The presence of carbonic acid in quantity explains this action." It was decided as the result of experiments that the corrosion of iron pipes is directly proportional to the carbonic acid present; that alum-treated water produces practically no more rust than the Croton water, untreated, mainly because the amount of carbonic acid set free is small; that it is desirable only to neutralise the free carbonic acid either with lime or soda.

The fact that complaints of rust are more general with filtered waters than with unfiltered waters is probably to be explained by the action of the clean filtered water in removing existing protecting coats and deposits, and keeping the iron surfaces somewhat cleaner. To eliminate a possible source of complaint on the introduction of filtered water, it was decided to add lime or soda so as to reduce the carbonic acid to a point where no objectionable effect would be experienced.

DETAILS OF WORKS PROPOSED.

The chemical mixing chamber had a capacity of twenty-eight minutes' normal flow, and a velocity of 1 ft. per second. The settling basins gave a period of detention of six hours, and a velocity of ·40 in. per second. A special basin was also provided for settling the filter-wash water so that it might be refiltered at times of water shortage.

Eighty filters were provided with an effective sand surface of 359 sq. ft. per 1,000,000 gallons rating. The filter sand specified was unusually coarse, being from 0·60 to 0·70 mm. effective size. The plans pro-

[illegible] for three types of [illegible] [illegible] were tested.

[illegible] of hypochlorite of lime [illegible] through channels at 1 ft. per second velocity, after [illegible] be satisfied as assumed.

[illegible] for the [illegible] 150 cub. ft. per 1,000,000 gallons per day, [illegible] solution tanks 50 cub. ft., in the same proportion, [illegible] pension tanks 42 cub. ft., in the same proportion, and hypochlorite solution tanks 34 cub. ft. per 1,000,000 gallons per day.

OPPOSITION TO THE PROJECT.

[illegible] and disinterested engineers, was again referred to another advisory commission, the majority of whom reported favourably. Mr. Fragee, assistant engineer, [illegible] stating that the advancement of sanitary and medical [illegible] treatment (hypochlorite application) and the inoculation against typhoid, tend strongly to discount the conjectured possibility of future outbreaks pending [illegible] abated. Finally, Mr. Mitchell, the Mayor of New York, "reported to the board of estimate his deduction that, in his judgment, hypochlorite would make the water safe, and that aëration would serve to remove from 50 to 75 per cent. not only of the tastes and odours, but also of the colour and turbidity from the water. With this he cast the vote which killed the project."

SPECIAL FIRE SERVICE AND FIRE PATROL WORK.

AN EMERGENCY FORCE.

We have received for publication the following letter, signed jointly by Lord Londesborough and Mr. Edwin O. Sachs, chairman of the British Fire Prevention Committee:—

"Fire brigade and fire patrol work will shortly be [illegible] for our fortified and defended places, for our arsenals and national stores, and for certain Government establishments requiring special protection.

"We are thus preparing a roll of retired fire brigade officers and firemen—both professional, volunteer and private—who are ready to join an emergency fire service force or forces to be placed at the disposal of the Government.

"To a limited extent we are also prepared to put [illegible] officers and firemen of [illegible] (country) brigades—both volunteer and private—not exceeding three from any one brigade.

"We also desire to form a supplementary roll of young engineers (used to steam engines or motor cars), and young surveyors or architects (used to building, survey or dangerous structure work), who, [illegible] would be valuable in an emergency fire service force.

"Applications to be entered on the roll should be addressed to us at the offices of the British Fire Prevention Committee (8 Waterloo-place, London, S.W.), the organisation and staff of which will be at our disposal.

"Application should be made *in writing only*, with the following particulars: (1) Full name; (2) address; (3) age; (4) vocation; (5) fire brigade experience, with dates; (6) special qualifications, if any; (7) reference; and further (8) whether the applicant is prepared to serve (*a*) gratuitously, (*b*) under the same conditions of pay as the Territorials, or (*c*) if the ordinary professional rate of fire brigade pay is required."

Trade Note.—The Adamant Stone and Paving Company, Limited, of Palace Chambers, 9 Bridge-street, Westminster, S.W., whose works are at Aberdeen, have despatched during the past week upwards of [illegible] of their Aberdeen Adamant footway paving slabs in the following vessels: s.s. "Lossie," s.s. "Ferryhill," s.s. "Briton," s.s. "Maggie Lough," and the sailing ship "Mary Miller." This demonstrates their facilities and capabilities for loading large quantities of paving in a very short time from their wharf at Aberdeen.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it the [illegible] a rather notable instance of the [illegible] At a recent meeting of the Twickenham Education Committee Mr. F. W. Pearce, [illegible] that body as well as to the urban district council, was asked what progress had been made with regard to the affixing of tablets on historic houses in the district. To this Mr. Pearce replied that he felt responsible for any delay in the matter, but would devote to it the first week of his holiday!

* * * *

Should not Mr. Herbert Samuel, the President of the Local Government Board, be congratulated on [illegible] more broad-minded that his predecessors in office? For he has not stated that the board would be prepared to consider applications from sanitary authorities, whose accounts are subject to audit by the district auditors, for sanction to reasonable expenditure in connection with the holding of "Health Week" in their district in November of this year? Is not this concession a step in the right direction, and may it not lead to a more favourable consideration in the future of the question of the payment of the expenses of surveyors attending conferences and meetings at which are discussed questions materially affecting the national health?

* * * *

When will the traffic in London reach such a congested condition that it will be found necessary to prohibit the cartage of heavy goods through certain streets between the hours of 8 a.m. and 11 p.m., and does not this seem to be an obvious though rather drastic solution of a part of the difficulty?

* * * *

Are not pedestrians themselves responsible in great measure for the numerous accidents that occur? Is it not a fact that not one in a thousand foot passengers make use of the subways provided at the bottom of Whitehall, and that still more dangerous crossing near Blackfriars Bridge?

* * * *

Is it possible that the London County Council can be so ill-advised as to contemplate spending a further £1,000,000 of the ratepayers' money on a scheme for linking up their tramways? Is it not evident that with the advent of the "flexible" motor omnibus the tramcar is doomed, and that the now old-fashioned ponderous "Noah's Ark" of traffic must give way to the agile fleet of rover motor 'buses? Does not this attempt by the London County Council look like throwing good money after bad?

* * * *

Is it not almost inconceivable that the London County Council are now proposing to run a double line of tramways from the terminus at the northern end of Vauxhall Bridge-road along Victoria-street to join the existing tram lines at Westminster Bridge? Is it not curious that while, on the one hand, the question of relieving the ever-growing traffic in the London streets is exercising the minds of all thinking people, the London County Council should still be engaged in placing the most serious obstructions that are known to traffic in our already congested streets? When will that body realise that the tramcar is as much out of date as the hansom cab?

* * * *

Where is Kirkham, in Lancashire, and why should it have achieved an unenviable notoriety for dirt and squalor? Those of us who are acquainted with Dr. Sargent, the medical officer of health for the county of Lancashire, will know that in his report on this unsavory place he has probably not exaggerated his indictment in the least degree. What is Kirkham going to do?

* * * *

Is not the proposed imposition of a tax on motor omnibuses using our roads a reversion to the old policy of about 100 years ago, when Acts of Parliament were framed to endeavour to adapt traffic to roads instead of the roads to the traffic? Is this policy any more likely to succeed than it did then?

* * * *

Has any consensus of opinion yet been arrived at as to the maximum amount of traffic on a road that renders it more economical to substitute a different kind of wearing surface to that which exists? For instance, when is it more economical to substitute wood for a bituminous surface, or granite for wood?

Town Planning in Relation to Tramways.*

By J. A. BRODIE, City Engineer, Liverpool.

I quite appreciate the importance of the relation between proposed means of conveyance and the development of town areas, as during the past thirty years I have been directly responsible for the construction of the horse tramway lines and for their relaying and maintenance, and also for the design, construction, reconstruction and maintenance of the electric tramway lines laid within the city of Liverpool. During the greater part of this time my work has consisted also in the carrying out of all street improvements and widenings as well as the construction of new wide streets and the supervision of building estates involving the provision of new houses for, approximately, 150,000 inhabitants, all of which items form important portions of the work which is likely to come under the general heading now known as town planning.

The main streets and roads have always been the principal feature in the old plans of towns, and they must, I think, continue to form the real backbone and frame to which the details of any effective town planning scheme are to be fitted. The success and prosperity of any town has in the past largely depended on the facilities for traffic, and there can be little doubt that speedy local passenger transport is likely to play a very important part as affecting the development of town areas in the future.

The principal lines of traffic in any large town, if reduced to a simple diagram, will generally be found to show a central area from which lines radiate to the outskirts as directly as the physical features of the area permit. At distances from the centre subsidiary lines for belt traffic are required, and, if properly planned in advance, they can be utilised to assist in reducing the further congestion of the central area. Such a diagram of Liverpool and its immediate surroundings shows that the river Mersey forms an important interference with the lines of the diagram in a westerly direction, while the steep hills encountered in the direction of Everton, lying to the north-east, have hitherto prevented any direct approach through this important and densely populated district to the undeveloped land which at this point is nearer to the central area than at any other.

THE HISTORY OF STREET IMPROVEMENTS

in England shows that, up to the passing of the Town Planning Act, 1909, no general powers existed in this country for the purpose of effectively dealing with street improvements, and practically no variation or improvement of the line or direction of any proposed street, however important, could be introduced, except by agreement with the landowner, without first obtaining special Parliamentary powers for each particular work.

Immediately outside the town boundary matters were worse still, for here the control was in the hands of the small local authority who had not the means to carry out improvements on any proper scale, and Parliament refused to allow the large authority to have any voice in, or to help improvements outside its boundary, without first obtaining special Parliamentary powers.

If the intention of Parliament had been that it should be made as difficult and expensive as possible for public authorities to arrange for satisfactory main lines of communication within and outside a town, then the old powers were certainly well arranged for the purpose.

Some small districts still continue to follow the old line of policy, and even county authorities, who might be expected to take a larger view of the position, have supported them; but, fortunately, many such authorities have taken a more reasonable view, and in the neighbourhood of Liverpool the councils of four large areas lying to the south of the city recognised that they could not deal with the question of town planning on a suitable scale except at—for them—great expense, and these districts have been included by agreement within the city on the understanding that proper schemes are to be prepared, so that there is some prospect of dealing with the southern section of the extended city on proper lines.

It has often been assumed that the proper arrangement of the larger towns has not in the past received much attention in this country as the importance of the subject demanded; but those who have read the old reports are in a position to know that in many cases these towns have, from time to time, given this subject great consideration, and that the blame is attachable rather to the want of foresight of those who, in the past, controlled the purse strings—to the fear of heavier calls upon the ratepayers—and to the lack of powers to assist, and at the same time control development, which powers are so conspicuous a feature in the recent town planning legislation.

As the result of want of powers, combined with want of foresight, many additional roads of much too narrow width have been added in town areas in England, and though about £4,000,000 sterling have been expended in Liverpool during the past fifty years, it can safely be said that none of the most important streets in the old part of the town are of a width in excess of present requirements.

It cannot be said that in any of our English towns heavy expenditure on such improvements are at an end. On the contrary, it is probably not far from the truth to say that a new era of road improvement and widenings is about to commence, and it is therefore specially important that attention should be given to this section of the subject.

Experience in connection with street improvements near the centre of the town shows that about four-fifths of the whole expenditure goes in payment for houses and compensations, all of which would have been avoided if care had been taken to see that ample width for traffic purposes had been originally provided.

In 1908 Liverpool obtained a special Act which gave power to the corporation to control the widths, direction and gradients of all roads likely to become main lines of communication, and either by negotiation or under the powers of the Act about 20 miles of roads, varying from 72 ft. to 120 ft. wide, have been constructed as new roads or as widenings of existing roads, principally on the outskirts.

The powers contained in

THE TOWN PLANNING ACT OF 1909,

if properly exercised, will also be of immense advantage in connection with the provision of main roads, and some of the points which are likely to have a most direct effect on local traffic conditions are, briefly, as follows:

(1) The planning of new areas likely to be developed in the outskirts, and construction of main streets and roads through them.

(2) The replanning and rearrangement of the older congested areas in towns and the rehousing of the displaced inhabitants.

(3) The reduction of the number of houses to the acre.

(4) The purchase of land for housing schemes.

(5) The provision of open spaces, parks, recreation grounds, &c.

(6) The allocation of areas for industrial purposes.

When these points are looked into from the purely surface passenger traffic view it will be seen that, while the four latter may have some effect on the amount of traffic likely to be provided, the really important points are those connected with the planning and provision of the main streets and roads, whether through new or old areas.

An interesting question which arises in this connection is: At what distance apart should such main lines of communication be provided? So far as I can find out no standard on the basis either of distance apart, of population served, or of most economical headway between vehicles has been arrived at, and it appears very desirable that more accurate knowledge as to the population served by any line of tramways should be available. The want of knowledge arises, no doubt, from the fact that hitherto tramways have had to follow such main roads as existed; but if really careful planning is to be adopted these points may require to be more carefully looked into.

The average distance apart of tramway lines at the approximate limit of the closely built-up area in Liver-

* From a paper read at the Annual Congress of the Tramways and Light Railways Association at Newcastle-on-Tyne.

pool may be taken at about 800 yds., the average of houses at this point being about twenty-five per acre, and the average walking distance to the nearest stopping-place being about 500 yds.

In the case of Liverpool, the town planning of the whole of the area lying to the south of the built-up area and within the city boundary is, at the present time, under consideration.

In these districts it will probably be found that tramways will be required, when the buildings are developed, at a maximum distance apart of about 1,000 yds., but this will depend, to some extent, on the number of houses allowed to the acre and other conditions, such as the amount of ground allotted to playgrounds and parks. It will be understood, however, that there is likely to be considerable difficulty in foreseeing what may be the requirements for portions of these districts which may not be fully developed for, possibly, forty years.

Other questions which may arise are:—

At what distance apart should stopping-places be provided on a well-designed system of tramways?

Are travelling facilities likely to be of such importance in the future that stopping-places should be taken into consideration when laying out the internal planning of the areas lying between traffic roads?

If so, should the positions of subsidiary crossroads be determined by the best position for stopping-places?

Or may these points be left to chance as hitherto?

A very considerable change has occurred in connection with all forms of street traffic since the introduction of

THE SELF-PROPELLED VEHICLE

Ample width in the first instance is now a matter of the greatest possible importance in all main thoroughfares where the general traffic is likely to be considerable, and 80 ft. may be looked upon as the minimum width which should be adopted in any important main thoroughfare leading towards the centre of any considerable community.

Where land can be acquired on reasonable terms, as in the outskirts of a large city, the widening of the most important main thoroughfares to 120 ft. can be strongly recommended wherever the street authority and the tramway authority are anxious to provide the best possible accommodation for traffic, and are prepared to work together with this object in view.

The design of the surface of such a roadway is of itself an interesting problem.

In the case of

A 120-FT WIDE ROAD IN LIVERPOOL,

the tramways are laid on wooden cross sleepers on a clinker foundation, the clinker being brought up to the level of the top of the sleepers, and over this soil is laid for grass, the top of the soil being left at the level of the bottom of the head of the rail. The roadways outside the tramway track, where new, are being laid with a clinker concrete foundation with macadam stone embedded in its upper surface, and the wearing surface of these roads is finished in pitch macadam, the traffic expected along this route, though considerable in quantity, being generally of fairly light type.

The arrangements made in regard to the 120-ft. wide road have been of such a character that the total cost of constructing the tramways and additional street surfaces can be carried out to the full width of 120 ft., without any greater cost than would have been necessary to provide for a street only 80 ft. wide with tramways of the usual construction and paved complete.

The cost of construction of a new tramway in Liverpool, including excavation, concrete foundation, permanent way and paving of the highest class, may be taken at about £6,000 per mile of single line, exclusive of the overhead equipment.

On taking out estimates for the simplest form of construction of tramways, which included crushed clinker foundation and ballast, the tramway being laid on cross sleepers and the surface finished in grass, it was found that the cost amounted to about £3,000 per mile of single line, exclusive of overhead equipment, thus showing a saving of approximately £6,000 per mile of double line of route.

It appeared, however, that such a track could not be laid and safely worked at a high speed, bearing in mind the other vehicular traffic, on a road only 80 ft. wide, which was the width originally intended by the street authority.

As the land adjoining a portion of this road, amounting to nearly 2 miles in length, could still be acquired for less than 5s. per square yard on the average, including all compensations, it became feasible, with the difference in cost of tramway construction between the two methods, to purchase a strip of land 40 ft. wide throughout this length, and on a careful consideration of the estimates the tramway authority agreed with the street authority that the road should be constructed to a width of 120 ft. The tramways are being constructed in the centre of the roadway, this area being fenced off from the general traffic by low hedges, and in this way any trespassing on the line will be avoided, and it will be possible for the tramway to run safely at any speed which may be authorised. The tramway undertaking will also have the benefit of the reduced cost of maintenance which the absence of the necessity for removing the paving when repairs or adjustments are required will allow.

The question naturally arises whether such a road will completely meet the requirements of fast services for local passenger traffic, and, if so, how far in the direction of the centre of the town it is possible to carry a wide road of this description, bearing in mind the cost of land and compensation?

THE TYPES OF AREA

which have to be dealt with may be divided roughly into four classes:—

(1) That already described in the preceding remarks in which the cost of land and compensations does not exceed on the average 5s. per super. yard.

(2) An area consisting of portions partly built up with unbuilt portions, gardens, &c., which would bring out the cost on the average to about £1 per super. yard for the land required.

(3) An area still nearer town where the buildings have probably approached the limit of their life which it may be necessary to deal with when rearranging and rebuilding so that it may be brought up to an up-to-date condition; where the cost of the necessary land for widening would approximately be £5 per super. yard.

(4) An area lying in the immediate vicinity of the central area through which the cost of widening roads will be a very considerable item, and where the cost of the necessary land for widening would be approximately £25 per super. yard.

On the basis of the cost of land given in these foregoing classes, estimates have been taken out, it being assumed that, where the road is widened to 80 ft., reconstruction of the whole surface will be required, whereas when widened to 120 ft., the existing roadway for 40 ft. will not require reconstructing. The total cost per mile of the respective classes of roads may be taken, roughly, as follows:—

Class 1.—40-ft. road widened to 80 ft., with paved tramways, £29,000 per mile; if widened to 120 ft., with tramways in special track in grass, £26,000 per mile.

Class 2.—40-ft. road widened to 80 ft., paved throughout, plus tramways, £53,000 per mile; if widened to 120 ft., with tramways laid in special track in centre, £65,000 per mile.

Class 3.—40-ft. road widened to 80 ft., paved throughout, plus tramways, £147,000 per mile; if widened to 120 ft., with tramways laid in special track in the centre, £252,000 per mile.

Class 4.—40 ft. road widened to 80 ft., paved throughout, plus tramways, £616,000 per mile. If widened to 120 ft., with tramways laid in a special track in the centre, £1,190,000 per mile.

I now propose to leave the question of wide roads, and deal with some of the questions affecting

THE FUTURE OF TRAMWAYS.

The main factor leading to success, in my opinion, will be speed. It is, indeed, unfortunate that too narrow and conservative a view has been so generally taken of the advantages likely to accrue to local passenger traffic from road widenings and improvements. If any considerable portion of a surface tramway route is laid along a street upon which, owing to the interference of other traffic, the lack of sufficient widths, awkward turns, or for other reasons, an average speed cannot be maintained which will enable it to successfully compete in the matter of time with other systems serving the same area, the surface tramway system, though to-day holding pride of place in

this country, as a means for local conveyance of passengers, is hardly likely to retain that position.

Speeds averaging from 10 to 25 miles per hour are already being given on systems having special tracks not interfered with by level crossings, where operated by electricity, and though a considerable loss of time is usual by reason of the difficulty of approach to the stations and the somewhat inconvenient distance apart of the stops, some of the districts served by such systems are already withdrawing residents, who, while formerly content to reside in town and at a distance of 2 or 3 miles from the centre, to use the surface-tramway system, now find it possible to reside outside the city at a three times greater distance from their business, and under pleasanter conditions, with the added advantage of being able to return home in the luncheon hour if they desire to do so.

Increased speed has come to stay, and both the town planning and tramway authorities must be prepared to provide arrangements which will meet the new conditions of life in large towns.

Combined with speed there must be

(1) Safety both for passengers and for the other users of the road.

(2) Comfort for passengers and for the occupiers of frontage property.

(3) Reasonable economy.

From what has already been said it would appear that the average speed should be increased to the neighbourhood of 20 miles per hour, though, owing to the inconvenience of surface systems and the greater number of stops, a lower speed would probably compete successfully. It is likely that stops would average six to the mile, as against about one stop per mile in the case of trains and two stops per mile in the case of tubes, overhead railways, &c.

Safety can be provided for in the case of fenced-in lines laid on wide streets, as the public and other traffic is excluded between stopping stations, and at stations the speed is of necessity reduced. Where, owing to the narrowness of the roads, a fenced-in track cannot be provided, a good deal could still be done by the street authority for the additional safety of fast traffic in main trunk thoroughfares by dealing with the junctions of side streets in such a way as to slow up any traffic coming in to the thoroughfare from them.

Such an arrangement could be made use of to prevent such traffic coming in on the wrong side or otherwise carelessly.

If speeds are to be increased, as appears to be necessary to enable tramways to contend successfully with other forms of passenger conveyance, the question of

NOISE AND VIBRATION

must be as far as possible eliminated. In the case of other road vehicles the problem has been successfully solved by the introduction of the indiarubber tread, and though the application of the indiarubber or other resilient and silent tyre to tramway vehicles would without doubt introduce some new and difficult problems, these are not incapable of solution by competent engineers, and it appears to be remarkable that such a comparatively simple solution of some of the problems which have been troubling tramway engineers should, so far as I am aware, not have been successfully experimented with.

The addition of some form of rubber tyres to tramway vehicles would no doubt slightly increase the working costs, but it is likely that the life of properly designed tyres would much exceed the life of tyres on motor 'buses or motor wagons, on which a life of 20,000 miles and over is quite common.

It must be remembered also that the addition of indiarubber tyres to the wheels of motor wagons using somewhat roughly paved roads and streets has now been warranted by economical results.

The wear on the rail surface would undoubtedly be much reduced, the cost of maintenance largely eliminated, and possibly the corrugation problem would sink into insignificance.

The other important point in connection with comfort and quietness which still, in many cases, requires attention is the noise of the gears very commonly used.

It can hardly be expected that high speed and more luxurious riding will lead to much greater economy in operation as compared with the present-day slow traffic. There does, however, appear to be an opening for tramway vehicles with a reduced proportion of weight per passenger carried, and lessons may well be learnt from motor-vehicle construction, which has become quite an art, and in which special and expensive materials are largely used for the purpose of reducing the weight to be moved. Motor 'buses capable of carrying thirty-four passengers are being turned out at a weight of about 2 cwts. per passenger, as against about 3·5 cwts. per passenger in the case of tramcar construction.

With regard to the track, economy in first cost and subsequent maintenance is likely to be secured wherever the track can be separated from the ordinary road traffic; but where the lines are laid in the ordinary carriageway, both first cost and maintenance charges are probably now at a minimum, wherever first-class work is done and the very best materials are used. In the case of Liverpool our standard Welsh stone pavement on a concrete foundation has withstood the ordinary steel-shod traffic for periods exceeding thirty years, and in some cases exceeding forty years, without costing 6d. per superyard for genuine repairs within that time. The repairs of such a surface may, therefore, be taken at a negligible quantity. So good, in fact, was the paving material in Lord-street, which was put down in 1877, that when the cross-sectional levels of that street were altered last year the setts which had been down all that time were again used for repaving the street.

It is therefore evident that the question of the cost of repairing streets within tramway limits and the proportion chargeable respectively to the tramways and street authorities are, in some cases, misunderstood or slightly exaggerated, and that in this, as in most other cases, there are two sides to the question.

WIMBLEDON CORPORATION'S BILL.

The Select Committee of the House of Commons last week passed, with certain amendments, the Bill promoted by the Wimbledon Corporation for an increase of their powers. The Committee refused to sanction Clause 122, which provided that "any pool, gutter, or water within the borough which is a breeding-place for mosquitoes shall be deemed to be a nuisance." They passed a clause authorising the corporation to construct and maintain "Turkish, medicated, and other baths, including baths the efficient properties of which are due to agencies other than water."

With reference to the clause giving the corporation authority to require separate sewers for surface water, the borough engineer (Mr. C. H. Cooper) said there was a sewage farm of 60 acres, surrounded by houses, within the borough, and it was important to the public health that the discharges on that area should be manageable, which was not the case when storm water came down the ordinary drains. Another reason why separate sewers were desirable for storm water was that without them the overflows which followed storms carried foul matter into the streams. There were many separate sewers for surface water already, but they were wanted everywhere, with authority, which did not at present exist, to prevent their connection with ordinary drains. The proposal was approved.

With respect to a provision that the corporation should have the right to prohibit the turning of petrol into the sewers, Mr. Johnson, sanitary inspector, said there were many garages—private and public—in the borough, including one belonging to the London General Omnibus Company, with 15,000 gallons of petrol in store, and another with 3,000 gallons. Not only were sewers damaged by petrol, but it was dangerous to workmen. There had been explosions through the presence of petrol in the sewers, and as long ago as 1907 the authorities issued a notice warning people of the danger. The clause was sanctioned.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Treasure from the Dustbin.—The dustmen employed by the Brighton Corporation are aggrieved at the decision of the local authority to invite tenders for the disposal of saleable articles collected from dustbins and to pay the men a bonus on the proceeds. Hitherto the dustmen have divided the proceeds, and declare that they have made 5s. a week each in this way.

Institution of Municipal and County Engineers.

THE CHELTENHAM MEETING: GENERAL ENGINEERING SUBJECTS.

Among the papers presented at the recent annual meeting of the Institution of Municipal and County Engineers [illegible] and [illegible] entitled:

NOTES ON THE PROTECTION OF THE FOUNDATIONS OF CHEPSTOW BRIDGE OVER THE RIVER WYE, IN FERRO-CONCRETE

By E. S. SINNOTT, M.INST.C.E.,
[illegible]

The bridge over the river Wye, which connects the counties of Gloucester and Monmouth at Chepstow, was built about [illegible] ago, the existing parapet bearing the date 1816. It consists of five spans composed of cast-iron ribs, the central, which is the largest, being 112 ft. at springing level. The total length between abutments being 364 ft.

The cast-iron work (which in the case of the central span has been supplemented in recent years by steel ribs of box section) is carried by four piers, and [illegible] in bank.

The piers supporting the central span are respectively on the Gloucestershire and Monmouthshire [illegible] of the centre of the river, and are both substantially in the main waterway. These piers are protected by masonry starlings, having pointed ends up and down stream.

There is no evidence as to the precise nature of the foundations upon which the piers rest, or how they were constructed below low water mark in the first instance. The starlings were composed of a poor quality concrete with large stones bedded therein finished in masonry, and surrounded by timber sheet piling, having diagonal timbering attached to the face with a longitudinal waling at the top. For several years the starlings surrounding both the main piers had shown signs of decay, and during 1902-4 the County Council of Monmouth undertook extensive repairs to the side for which they are responsible.

In the summer of 1910 the writer carefully examined the starling on the Gloucestershire side, and formed the opinion that it would be necessary to remove the whole of the timber work then existing, and replace the same with ferro-concrete piles, making good the cavities as the work proceeded. A [illegible] survey was then made, and certain temporary repairs were carried out to prevent any further disintegration of the old work. Later it was decided to adopt the Hennebique system of piling, and in consultation with Mr. Edmund J. Cullis, ASSOC.M.INST.C.E., who represents Messrs. Mouchel & Partners, in Gloucester, detailed plans were prepared.

The scheme provided for 210 piles (finally increased to 217), varying in length from 10 ft. to 25 ft. (Figs. 1 and 2), connected at the heads by a longitudinal ferro-concrete capping, with ties across the top of the starling to two anchor blocks, at the up and down stream ends respectively (Fig. 4).

Owing to the great rise and fall of tide at Chepstow, which at spring is as much as 50 ft., it was necessary to avoid disturbance to the old masonry and concrete as much as possible, and it was arranged that the timber piles should be drawn slightly in advance of the new piles being driven. This precaution was important, as when the new piling was started it was found that the cavities were very extensive, and in some parts the surface of the starling was entirely undermined, almost to the face of the pier; at the down stream end this undermining extended inwards 16 ft. from the apex, forming a cavity of some 50 cub. yds. capacity.

The top of the starling being only 6 ft. above low water of spring tides, the amount of working time available—viz., two hours per tide—was, even under favourable conditions, extremely limited. During some neap tides, and when much fresh water was coming down, no work could be attempted.

The piles were moulded on the Chepstow side of the river, and after six weeks conveyed over the bridge on a two-wheeled bogie, from which they were hoisted by a winch to a wooden slipway laid on the Gloucestershire bank. Proceeding by this slipway to the level of the starling they were taken across a temporary wooden bridge between the first and second piers, and were ready for driving.

The pile frame was of the usual type, being 30 ft. in height; owing to the range of tide, special precautions had to be taken to secure it in position, as it was entirely [illegible] twice in twenty-four hours. The attachment to the old face of the starling consisted of lewis bolts let into the flat stones forming the top surface, the same being fitted with shackles, to which wire ropes were attached. The driving was accomplished by a 30-cwt. Whitaker ram, driven by steam supplied from a Partington vertical tubular boiler, 10 ft. by 4 ft., fixed on the Gloucestershire bank above high water mark, working at 80 lb. to the square inch. The steam was conveyed to the pile engine in a 2-in. diameter iron pipe, the maximum distance being 280 ft.

It was at first a question whether enough steam pressure could be obtained at this distance, but it was found that about 60 lb. per square inch could be relied upon, and this was sufficient for driving the ram. The pitching of the piles, preparatory to driving, involved much care owing to the small space available for movements of men and materials, and the great irregularity of the bed of the river; on several occasions as many as three piles were monopolised in getting one pile ready for driving. Before the work of each day could be commenced, the ram, steam pipe and [illegible] generally had to be cleared from the [illegible] which the previous tide had deposited, features all involving delay and slowness of progress. A helmet, constructed of mild steel with wooden buffer, and timber dolly were used between the heads of the piles and the underside of the ram, the maximum drop being 4 ft. 6 in.—as a rule, short drops of 2 ft. or thereabouts were used, when from twenty to thirty blows per minute could be delivered.

The piling was begun in January, 1913, at the up-stream end, and it was shortly found that it would be necessary to lengthen the piles as those at first driven did not reach a secure foundation at the depth anticipated. To ascertain the precise addition which would be necessary, individual wooden piles were withdrawn at different points on the starling, and from the information obtained the lengths finally adopted were arrived at.

In order not to waste any of the piles already constructed, the writer arranged for them to form the lower ends of and to be incorporated in longer piles of larger section [illegible] the result of this plan was quite successful, and the remoulded piles were satisfactorily driven. The piles as finally used varied from 18 ft. to 30 ft. in length. The bed of the river, from 2 ft. to 9 ft. below low water of spring tides, was found to be most irregular; for the greater part large boulders resting in clay were encountered, and the rate of driving was consequently very variable, in some cases a whole week would pass without a single pile being placed; at other times as many as eight per week were recorded, from three to four per week being a normal state of affairs. The apex pile on the down-stream end gave the greatest trouble; this was 30 ft. in length, weighing 31 cwt., and took fourteen days to drive.

It may here be pointed out that, in addition to the difficulties already enumerated, the rush of the water, both tidal and fresh, under the bridge is at all times very great, and the utmost vigilance was required to secure the safety both of men and plant. With respect to the former, a boat with lifebelt equipment was invariably in attendance when work was in progress—for night work the lifebelts were fitted with watertight lifebuoy lights for locating position.

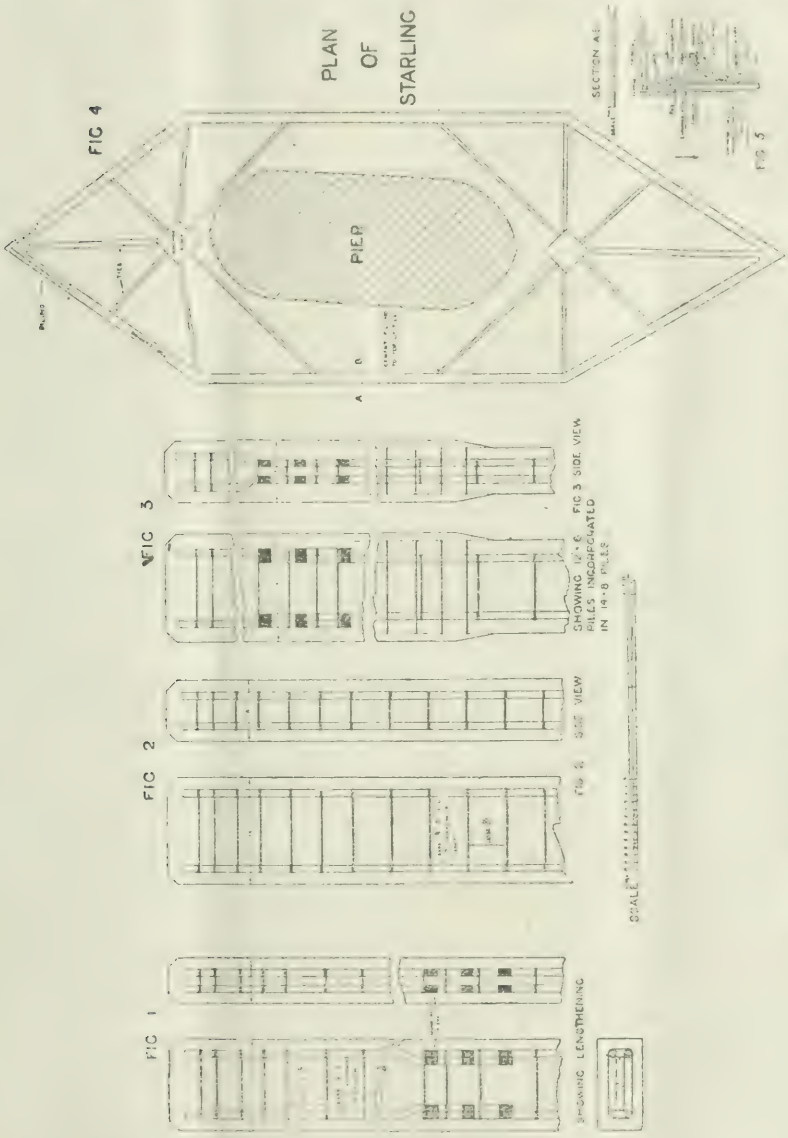
Despite the fact that the operations were carried on continuously day and night for over a year and a-half, no fatal accident occurred, and the pile engine was only once slightly moved out of position. As fast as the piling proceeded the cavities in the old work were filled in. For this purpose bags were used, in which concrete was placed—in the case of the larger cavities blocks of clean stone were inserted between the bags, with considerable saving to the amount of concrete used.

Owing to the irregularity already referred to in the bed of the river, it was found impossible to drive the piles to a perfectly true line, and to get over this it was decided to face the outside of the piles with concrete on expanded metal. This work was carried out from a timber float moored alongside the starling at

[illegible] water. Timber shuttering was made, inside which the expanded metal was placed, the same being connected to the steel work in the piles which was exposed for this purpose, though, later, special clips were installed on the piles to which the expanded metal was secured [illegible]. The concrete was then carefully rammed into place and a thoroughly satisfactory result obtained. Simultaneously with this work the ferro-concrete capping, cross ties, and anchor blocks were constructed, so that the whole starling was eventually encased in one homogeneous ferro-concrete structure. The spaces between the capping, cross ties and the pier itself were filled in with concrete (6 to 1), the whole being brought to a true surface at the top. This concrete was put in position and there retained by sacking covered with boards, pending its setting.

The contract was carried out by Messrs. Lambrick & Co., of Burton-on-Trent, represented locally by Mr. H. C. E. Goodman, to whom every credit is due for successfully organising and completing an extremely arduous and tedious piece of work.

The writer was represented locally by Mr. E. Larque, of the county surveyor's staff.



Chepstow Bridge over River Wye: Protection of Foundations in Ferro-concrete.

DISCUSSION OF MR. SINNOTT'S PAPER.

Mr. E. Wills (Chiswick) said the paper was useful to those who contemplated works of a similar character. He thought it was very good of the writer who had had experience in these works to give them the benefit of it. Ferro-concrete was still a new subject, and he was pleased [illegible] to it. It was useful to have a paper such as this included in the Transactions, so that they might study it when they had works of a similar character. They ought to show their appreciation of Mr. Sinnott for giving them the details so fully.

The Chairman (Mr. T. W. A. Hayward) said he should like to say that he sympathised with Mr. Sinnott in the difficulties he had had to contend with in strengthening the foundations of Chepstow Bridge. He knew the locality, and the flow of the river, and he appreciated the difficulties which had to be overcome.

Mr. Sinnott mentioned that if any gentlemen were carrying out similar works, he should be only too glad to give any assistance he could. He had got a good deal of information.

(To be continued.)

Royal Sanitary Institute Congress at Blackpool.

[illegible] the [illegible] read [illegible] the Royal Sanitary Institute Congress at Blackpool.

OUTFALL SEWER CONSTRUCTION, WITH SPECIAL REFERENCE TO BELFAST.

By James Munro, M.Inst.C.E.
Deputy City Surveyor, Belfast.

In [illegible] of [illegible] necessary and [illegible] of [illegible] [illegible] [illegible] of this paper is to [illegible] to take into consideration this particular section of their work, and leave for a [illegible] and [illegible] to deal with the sewage itself which the engineers have collected [illegible] in the place most convenient for getting rid of it, or if the [illegible] they have no to dispose of.

As every portion of the country which is not a lake or marsh drains by gravitation to the sea, there is not, except under very exceptional circumstances, [illegible] in designing a scheme entirely depending on pumps.

A [illegible] of necessity remove the natural watercourses, but there is no doubt the extension of buildings and streets with impervious surfaces sends the water more rapidly into the outlets, natural or artificial, provided for it. In fixing the sizes of sewers the sewage is the smallest item to be provided for, and the rainfall or surface water is the volume which needs most careful consideration.

The growth of the area within a reasonable period, and the increased use of water as the population increases both in opulence and numbers, must not be forgotten. Many communities which a few years ago considered 25 gallons per head an ample supply now use 50 gallons. As sudden rainfalls often multiply the volume to be dealt with by 12 to 15, the positions of storm overflows and their possible effect on the streams or other outlets into which they discharge require careful study.

The problem in Belfast has been one of extreme difficulty. A large area of the city has been reclaimed from the sea, and many acres are so far below high-water level that they are only kept from daily flooding by the quay walls, which are 0·6 ft. above the highest recorded tide and 4 ft. above ordinary high-water. Formerly the sewers all discharged into the harbour or into rivers which in turn discharge into it; they were protected by valves, and only discharged on the last half of the ebb tide. These have now been intercepted, and the area drained by them, and also the whole of the co. Down portion of the city, 5,400 acres, form the low-level drainage area. It will be seen that as no storm overflows are available from the lower portion of this area except at and near the time of low water, storm pumps to relieve the sewers are unavoidable. The intercepting sewers extend for about 3 miles on the co. Antrim side of the river, and rather more on co. Down side, through lands and streets made on the reclaimed areas; they have a fall of at least 2 ft. per mile, and on the portions nearest the river are almost entirely through alluvial deposits known locally as "sleetch," or in filling of all kinds deposited inside the reclamation embankment.

The difficulty of construction in ordinary filling was of the usual kind met with in such material, and is not further referred to. The sleetch is a remarkable material; when dry it crumbles like fine sand; with a little moisture it swells and becomes like a soapy clay; with a quantity of water it has the consistency of soft dough.

The main outlet sewer was constructed for a mile in slob lands of sleetch, which are dry at low water, but covered from 2 ft. to 6 ft. at high water. As an example of the unstable nature of this sleetch, it may be mentioned that when the author was making the surveys for the scheme in 1886 he put a man out of a boat on the apparently firm bank of a channel to fix a pole; he sank so quickly in it that he was rescued with difficulty, yet when the work was being carried out this same bank proved one of the firmest places met with and most difficult to excavate.

When the scheme was laid before Parliament it provided for four cast-iron pipes, each 4 ft. in diameter, surrounded by concrete, as the outfall sewer into the sea, one-fifth of a mile in length.

The landowners on the lough side objected to the position of the outlet and opposed the Bill. The corporation directed their consulting engineer to meet the adviser of the opponents, both very eminent in their profession, and settle the matter amicably. They agreed to omit the iron pipes, and construct instead a wooden double trough 1 mile long under the slob, with its outlet in deep water. This chute, as it was termed, is constructed of pitch-pine, which was shipped at Galveston, already cut to the scantlings required and floated from the vessel direct to the work. The method of construction was as follows: Two rows of sheet piles were driven of a length sufficient to form a half-tide dam, and constituted the permanent outer sides. The range of tide is 8 ft. in Belfast. When a length of 100 ft. or so had been driven, a cross dam was formed, and when the tide had fallen to the level of pile heads the dam was pumped out and the excavators had about six hours' work before the tide rose over the piles again. When a length had been excavated the centre piles were driven, and the construction of the woodwork completed. When a length was finished, the pile sides forming the half-tide dam were cut off and were sufficiently long to form the centre piles for another length. In due time the chute was completed. Its action in the slob or sleetch was very interesting to those not concerned, but those responsible had many worrying days and sleepless nights over it. One Job's comforter was always giving his views through the Press or otherwise, generally reporting that "it was floating down the lough." It has not done this, although for twenty-five years it has lost many a plank and cost a great deal to repair. Many remedies were proposed for it. Hundreds of tons of old concrete were placed on its top, and strong piles fixed to keep it in its place. It is still there, but is unsatisfactory. He would be a brave man who would attempt or even propose a similar construction again. A ferro-concrete outlet sewer is now being constructed alongside it; when this has been completed the old wooden one will be abandoned.

Lessons to be drawn from the experience gained are that compromises made between rival consulting engineers in the short time available during the progress of a Bill before a Parliamentary Committee are not always satisfactory, and that the considered design of an engineer who knows local conditions should not lightly be set aside.

This new outlet sewer through the slob lands will be in progress for more than another year, and is well worth a visit by any who can afford the time.

The present city surveyor, Mr. H. A. Cutler, M.Inst.C.E., carried out the repairs to the 5,500,000 gallons storage tanks constructed on the slob in a very ingenious way. These tanks were leaking and cracked in the bottom and sides; to rebuild them would have probably cost £40,000, besides the terrible upset to the whole outfall of the sewers. He took one tank at a time and forced cement grout into the crevices and under the floor; altogether 1,120 tons of cement were used. It was mixed with an equal quantity of sand, and was put in under air pressure varying from 7 lb. to 15 lb. per square inch. The reservoir is now quite watertight.

Excavations recently made alongside it show that the grout found all the crevices in the foundation and followed them through the sleetch even 4 ft. beyond the outer walls.

The outfall sewer from junction of the high-level and low-level sewers at No. 1 pumping station to the outfall works is laid along the centre of an embankment about 150 ft. wide, formed of dredgings and sleetch lifted from the harbour during the previous twenty years. There is a timber pond on each side. When the sewer was commenced this embankment was comparatively dry, and the trench stood without timbering; those in charge were charmed, and for a week or two boasted of how cheaply the work was being constructed. Alas for their hopes! A few wet days changed all this, and sheet piling had to be adopted and left in for the entire length of the work to keep the sewer in line. Notwithstanding this precaution the arch cracked from end to end, and had to be made good before the sewer could be used. Some portions of it have spread, and had to be replaced

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recently. A road 50 ft. wide is now made along the embankment, and forms the approach to the outfall works.

As a relief to the main outfall sewer, and to make it available in times of storm for the increased volume flowing from the high-level area by gravitation, it was arranged to lay a 4-ft. diameter pumping main direct from No. 1 pumping station to the outfall works, a distance of about 1,000 yds.

Before deciding on the use of steel pipes careful examination was made of similar pipes which had been in use for some time as a sludge main from the tanks to the jetty where the steamer is loaded, and also, some others carrying the main outfall sewer under a sea channel; these proved to be in such good condition that the city surveyor had no hesitation in adopting similar pipes for this main.

They are 4-ft. diameter welded-steel pipes, $\frac{3}{8}$ in. thick, with spigot and faucet joints. The material is in accordance with the British Standard Specification, and has a tensile strength of not less than 24 tons nor more than 30 tons per square inch, with an elongation of not less than 22 per cent on a test bar 6 in. long. The pipes were raised to a temperature of 300 deg. to 350 deg. Fahr., and then dipped in a bath of Dr. Angus Smith's bituminous compound kept at a temperature 300 deg. Fahr. during the operation, after which they were covered with a wrapping of asphalted jute. They were then weighed, and the weight painted in white lead on the inside of the socket. When laid, the joints were caulked with gasken and $2\frac{1}{2}$ in. of lead wool.

One decided advantage in the use of these pipes is the smaller number of joints to be made in laid ground, and the reduction of the volume of underground water which can enter such a pipe.

The amount of subsoil water which finds its way into trunk sewers, notwithstanding all attempts to make them impervious, is very large. Careful investigation in Boston proved that in pipes from 8-in. to 36-in. diameter at least 40,000 gallons per mile per day got into the sewer, and it is estimated that on the average of large trunk sewers, 75,000 gallons per mile per day had to be provided for. These figures have, I believe, been adopted in the reports of the New York Sewage Commission. In waterlogged ground the figures would doubtless be greater.

On the other side of the harbour the subsoil is of an entirely different nature; sand is found in the lower portions, and red clay a little higher up. In the sand the tide rises and falls, evidently following some of the old channels of prehistoric days.

Some years ago, when a 5-ft. diameter sewer was being laid in a street 60 ft. wide, the trench was close-sheeted, and every precaution taken, as the contractor thought, to exclude water; yet he found it almost impossible to keep the trench dry enough to get in the concrete foundation, and claimed 50s. a lineal yard for an extra 6-in. depth of excavation and concrete. (It was allowed 9s.)

An examination of an old survey of 1791, which lately came into the author's possession, shows that the site was at that date under the sea, and from other sources it is now discovered that the site was reclaimed about 1833.

Extensions of this sewer several miles in length were made through good ground, but one branch about 1 mile, alone what at one time was the margin of the loch, was nearly all the way through running sand. The contractor, however, put on very powerful pumps, and was able to keep the water out of the trench a sufficient time to enable the lower part to be built. Cracks appeared in buildings about $\frac{1}{2}$ mile from the site; fortunately for him, his pumping operations were not suspected.

A relief sewer parallel to the main one referred to is now being constructed about 300 yds. nearer the sea; although the ground is not good, much of it being in-filling, the difficulty of construction is much less than in the case of the original sewer.

Mr. A. E. Collins (Norwich) proposed a vote of thanks to the author, and said he should imagine the conditions of Belfast were such as would almost frighten any engineer who tackled them. One thing that rather puzzled him was that low water was 4 ft. above ordnance level.

Mr. Munce said that was so.

Mr. J. S. Brodie (Blackpool) said he himself had had a good deal of trouble in solving the difficulty of outfall sewer construction, and he could sympathise with Mr. Munce in the difficulties he had experienced at Belfast. He thought a more inefficient proposal and a more unengineering proposal it had never been his lot to look upon than this chute. It showed the futility of these panic decisions before Parliamentary committees. The proposal taken by the corporation of Belfast for cast-iron pipes was perfectly sound and feasible, but when they got to Parliament they heard a lot of imaginary trouble of people living on the banks of the lough, and they had a hurried meeting in the corridor, and an insane compromise resulted in this wooden chute. A more unbusinesslike thing he never set eyes upon. He understood that the cost of the upkeep, which was stated would be about £100 a year, had been more like £1,000 a year. It showed how these hurried compromises were altogether to the disadvantage of the people who were most greatly interested, namely, those who had to pay the piper. He was glad to find that this old wooden chute was going to be abandoned, and a more business-like outfall constructed.

Mr. Munce, in reply, said the old wooden chute was half full of muck at the present time.

(To be continued.)

Sewage Works Apparatus.—Messrs. Tuke & Bell, Limited, 69 Leadenhall-street, E.C., have received two repeat orders for their sewage ejectors, which speaks well for the efficiency of their apparatus. They had previously put down for the Hayes Urban District Council, for Mr. Fidler, the engineer, two installations, complete with cast-iron tubing, and have received an order this month for a third installation. York City Council, through their engineer, Mr. Spurr, have also ordered from the firm three ejector installations, to be carried out at once at their sewage works.

Manchester Corporation Bill.—The Manchester Corporation Bill, which has passed its third reading, confers upon the town council powers of street widening, including authority for the removal of Cross-street Chapel, the carrying out of a number of tramway extensions, the construction of a new electricity generating station in Trafford Park, the construction of a new sewer in the Stretford district, the borrowing of £1,000,000 for the purpose of obtaining a further supply of water from Thirlmere by means of a fourth pipe, £300,000 for the extension of mains and other purposes in connection with the supply and distribution of water, and the readjustment of ward boundaries.

Law Notes.

Edited by J. B. REGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

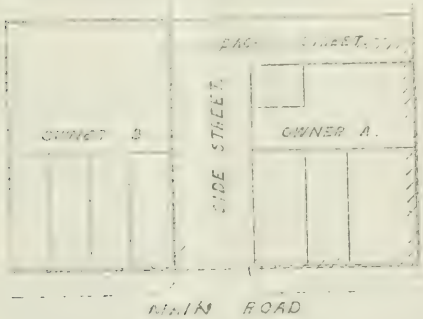
[illegible] questions relating [illegible] authority. Correspondents [illegible] addressed to [illegible] plume." *Where necessary, copies of local data or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in black ink only, and in such size as to be fit for direct reproduction [illegible], without re-drawing or amendment. [illegible] *conditions* [illegible] *supplied with as* [illegible] *to reply to queries.*

[illegible] County Council [illegible] Act, 1911. [illegible] Division. [illegible] the council of the East Hill [illegible] the purpose of carrying tram-lines down East Hill. For this purpose they served notice to treat with the trustees with respect to the whole of the forecourt of the chapel, except a strip 2 ft. wide. Section 18 of the [illegible] Provided that [illegible] interfere with the main structure of any house, building or manufactory." The gradients in the neighbourhood were very steep, and the carrying out of the council's scheme would bring the roadway to within a few feet of a flight of steps leading the [illegible] rendering such access dangerous and almost impossible. Mr. Justice Joyce held that the proposed alterations would not only interfere with, but would practically destroy access to the chapel, making it dangerous and almost impossible, unless extensive alterations were made to the main building; and that the destruction of such access, so as to render it impossible to use the building without extensive alterations, would constitute such an "interference" with the main structure as was contemplated by the proviso. He accordingly granted the injunction asked for by the trustees.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

Highway not Repairable by Inhabitants at Large: Rights of Owner of Soil.—"H. G." writes: B leased a plot of land at the boundary of an estate of a landowner and built cottages right to the edge of land leased. A afterwards leased a plot from the adjoining ground landlord and built property, and included in the lease is the whole width of the side street, shown on plan. This street has been open



over twenty years, but has not been paved and taken over by the council. Owner B has once or twice had repairs done to wall abutting side street, but contractor carrying out the repairs has obtained permission from A to place ladders on the side street leased to A. B recently desired to paint the whole of his wall abutting side street with gas-tar, and A objects to B placing ladders, &c., on his land to carry this out, as he urges that the black colour on the wall would be objectionable to him and damage his light. B then applied to me as surveyor for permission to carry out the work, but my view was that the council could not give permission for this in a street not repairable by the inhabitants, and that, although the public had a perfect right on the street, the right only extended to [illegible] (R. v. [illegible], 2 Q.B. 29) or A and in the side street to repair his property, or could he [illegible] twenty years?

(1) Yes, the right of the public is only a right of passage, and the owner of the soil would be entitled to remove scaffolding or ladders placed thereon. Presumably A, as lessee from the owner, has the same right during the term of his lease. (2) In my opinion he cannot. The street being subject to a public right of way, B is entitled to access thereto from any part of his property, but in other respects he has only the same right as the other members of the public. If for twenty years he had from time to time used the street for the purpose of repairing his property wherever he pleased to A's knowledge and without asking A's permission, and without any objection by A, he might possibly have acquired the right to do so.

Highway: Watercourse.—"F. W. R." writes: In rear of "[illegible] road in this district, which is now almost covered with house property, there is an old water course or ditch, which prior to the development of this district received the surface water from the surrounding agricultural land, passing through the district, and ultimately finding its way into the river. As the neighbourhood developed, and roads were constructed, the owners of the estates appear to have put in pipes for carrying the water under the new streets, some of which pipes are now insufficient to carry off the volume of water in wet weather. In other places the owners appear to have filled in the ditch or watercourse, and in some cases enclosed it, and the result now is that in anything like a severe storm the watercourse overflows into the backs of the houses, and sometimes over their gardens, with serious consequences to the occupiers. (1) What steps, if any, can the local authority take to remedy this nuisance? Please quote authority. No water from any house, or from any street vested in the council, drains into this watercourse. (2) Who is responsible for enlarging or maintaining the pipes under the streets? (a) Where the street is repairable by the inhabitants at [illegible] (b) where the same are private streets.

(1) Any watercourse in such a state as to be a nuisance or injurious to health can be dealt with by the local authority under secs. 91 to 111 of the Public Health Act, 1875. It has been held that it is not necessary that a nuisance, in order to be within this Act, should be also injurious to health. It is sufficient if the nuisance is one which interferes with personal comfort (*Bishop Auckland Local Board v. Bishop Auckland Iron Company*, 10 Q.B.D., 138). This nuisance would appear to do so. A "sewer" is not within sec. 91 (*Pelham Vestry v. London County Council*, 1897, 2 Q.B., 76); but a watercourse is not usually a "sewer"—at all events until it is extensively used as such (*Regina v. Cockermouth Local Board*, L.R., 1 Q.B., 328; *Pentney v. Lynn Paving Commissioners*, 12 L.T., 518; *Falconer v. South Shields Corporation*, 11 T.L.R., 223; *Wheatcroft v. Matlock Local Board*, 52 L.T., 356). I gather that this watercourse does not receive any sewage, and though the point is not free from doubt, I think the nuisance could be dealt with under the above sections. (2) It would appear that the pipes were laid prior to or at the time of the dedication of the streets. This being so, I think the presumption would be (in the absence of evidence to the contrary) that the dedication was subject to maintaining the pipes. If this view be correct, the highway authority would be responsible for the maintenance of the pipes where the street is repairable by the inhabitants at large; but in the case of highways not so repairable, no one would be responsible.

Combined Drainage.—"A. R." writes: In a rural district two adjoining houses belonging to the same owner are drained by one common pipe drain into a manure tank. The drain has become blocked, and requires cleansing. The owner claims that the drain receiving the drainage of two or more houses is a sewer, and vested in the rural district council. There are no other houses within a mile, or any public sewers within that distance. Are the council liable to cleanse and make good the drain?

In my opinion there can be no doubt that this is a "sewer" within the statutory definition, from the point at which the drains from the two houses unite, and unless it falls within either of the exceptions mentioned in sec. 18 of the Public Health Act, 1875, it is vested in the local authority, who are responsible for its repair.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to the Editor, St. Bride's House, 21 Bridelane, Fleetstreet, E.C. Envelopes must be marked "Assistants' Section" in top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams should be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

[illegible] is divided between

Mr. N. S. Jeffrey,
24 Westbrook Villas,
Darlington.

and

Mr. F. W. Fowler,
Town Hall,
Bexhill-on-Sea.

[illegible] the opinion of the judges [illegible] the month.

QUESTIONS.

This week answers are invited to the following questions:

414. Strength of Materials. Prove the formula $\frac{M}{I} = \frac{f}{y}$ and $\frac{M}{EI} = \frac{1}{r}$ with respect to beams, and explain the meaning of the symbols used.

415. Sewerage.—What conditions generally determine the adoption of either the "separate" or the "combined" system of sewerage in a town? ("Ajax.")

416. Concrete Floor.—Give two sections of a reinforced concrete floor for a span of 30 ft., showing the sizes and weights of the girders, and giving the necessary calculations. (K. G. F., *Buckfastleigh.*)

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. (King.)

418. Iron Curved Roof.—Show details of an iron curved roof of 40-ft. span, resting on girders and [illegible] on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G., *Buckfastleigh.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

411. Foundations for Chimney Shaft.—What calculations are necessary for finding the width and depth of concrete for the foundation of a square furnace chimney shaft, 150 ft. in height, on a gravel soil, and built in accordance with the London Building Act, 1894? (Student.)

The provisions of the London Building Act, 1894, relating to furnace chimney shafts are contained in sec. 65, and are as follows:—

Sec. 65.—Unless the council otherwise permit, every chimney shaft for the furnace of a steam engine, brewery, distillery, or manufactory shall be constructed in conformity with the following rules:—

(1) Every shaft shall be carried up throughout in brickwork and mortar of the best quality, and if detached shall taper gradually from the base to the top of the shaft at the rate of at least 2½ in. in 10 ft. of height.

(2) The thickness of the brickwork at the top of the shaft, and for 20 ft. below the top, shall be at least 8½ in., and shall be increased at least one half brick for every additional 20 ft. measured downwards.

(3) Every cap, cornice, pedestal, plinth, string-course, or other variation from plain brickwork, shall be provided as additional to the thickness of the brickwork required under the Act, and every cap shall be constructed and secured to the satisfaction of the district surveyor.

(4) The foundation of the shaft shall always be made to the satisfaction of the district surveyor, on concrete or other sufficient foundation.

(5) The footings shall spread all round the base, by regular offsets, to a projection equal to the thickness of the enclosing brickwork at the base of the shaft, and the space enclosed by the footings shall be filled in solid as the work progresses.

(6) The width of the base of the shaft, if square, shall be [illegible] of the proposed [illegible] of the shaft; or, if the same is round or of any other shape, then one-twelfth of the height.

(7) Any firebrick built inside the lower portion of the shaft shall be in addition to and independent of the thickness of the brickwork prescribed by these rules, and shall not be bonded therewith.

It will thus be seen that the foundations are left to the discretion of the district surveyor, but the design of the remainder is dictated in the rules given above. The area of the concrete foundation must therefore be calculated as below, and the weight of the chimney must be ascertained. We will assume that the chimney is of the minimum dimensions allowed by the rules; the external dimension at the base therefore becomes [illegible] ft., and the thickness of the brickwork for the bottom 10 ft., 3 ft. 4½ in. The simplest way of calculating the weight is to divide the shaft into sections according to the thickness of the brickwork, and take the length of the mean of the external and internal perimeters at half the height of the section; thus we get:

	Thickness.	Mean perimeter.	Weight of section in tons, assuming brickwork at 112 lb. per cub. ft.
	ft. in.	ft. in.	
Top 20 ft.	0 9	33 8	25·25
2nd "	1 1	35 6	39·94
3rd "	1 6	37 4	53·00
4th "	1 10	39 2	67·19
5th "	2 3	41 0	92·25
6th "	2 7½	42 10	112·66
7th "	3 0	44 8	134·00
Bottom 10 ft.	3 4½	45 8	77·06
		Total weight of shaft	601·15

To this must be added the weight of the footings. Assuming 4½-in. offsets, the number of courses of brickwork required to obtain the required thickness—viz., 3 ft. 4½ in.—will be nine courses = 2-3 high. The weight of the footings is therefore

$$\frac{(15'\ 9 + 21'\ 9)}{2} \times 2 \times \frac{112}{2240} = 39{\cdot}55 \text{ tons},$$

making a total weight of 643·70 tons, neglecting the weight of the concrete. Assuming the safe load upon gravel as 3 tons per square foot, we find that 214 sq. ft. are required, which is approximately 15 ft. square. It will be noticed that the area of concrete required to take the footings will be at least 21 ft. 9 in. square, being the dimensions of the footings, there thus being an ample margin of safety if the area of concrete be put at 23 ft. square to give the bricklayers room to work. The depth of the concrete would be made from 4 ft. to 6 ft. deep, according to circumstances. From this example it will be seen that any structure built in accordance with the Act will have an ample margin of safety provided that there is a fairly good soil under the foundations. (J. A. R., *Tunstall.*)

412. Marine Surveying. [illegible] at the place required, *i.e.*, in the case of sewage outfalls at the proposed site of the outfall, and allowed to float freely away. They are then followed by a steam launch or other boat, and their positions determined by a sextant [illegible] land, or two plane tables or theodolites may be set up on land at different points, and the observations made by that means. The observations are taken at fairly frequent intervals, and plotted upon a plan, and the time of the observation marked

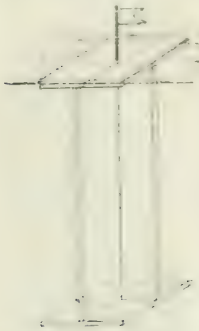


Fig. 1.

Fig. 2.

against it. This is done for every float, the separate ones being easily distinguished by different coloured flags, and if a fair curve be drawn between the points [illegible] the path of the float is obtained. While the observations are being taken a tide gauge is being read continuously on [illegible] and plotted to a curve showing the height of the tide at any time. The path of each float is then divided into hourly intervals [illegible] and direction of the float and tide for the various states of the tide. The observations should be repeated frequently at different periods of the lunation, both at neap and spring tides, so that the currents are obtained for all states of the tide. By combining a number of such observations a general diagram can be prepared showing the direction of the currents on the flood and ebb respectively. For deep-water observations the type of float shown in Fig. 2 is best. The observations in general should be taken upon as calm a day as possible, so as to minimise the effect of the wind upon the float. (J. A. R. *Pass Lane*.)

Mechanical Filtration of Water.—A meeting of the Royal Sanitary Institute will be held at Shrewsbury on Friday, October 9th, when a discussion on "The Value of Mechanical Filters in the Purification of Water" will be opened by Dr. Thomas Orr, medical officer of health to the corporation of that town. The chair will be taken at 7.30 p.m. by Mr. H. Percy Boulnois, M.Inst.C.E. On the following day visits will be made to the [illegible] tion, the waterworks and public abattoir. The members will be entertained to luncheon by the mayor.

Traffic on Surrey Roads.—A census of the road traffic has been taken by the Surrey County Council into the changes in traction. In five years the number of motor-cars passing along the Portsmouth road has doubled, and the number of motor lorries has quadrupled. The motor omnibus has made its appearance since the first census, and now has a figure of 1,235 for the seven days of the census. As compared with 1910, there were 2,000 fewer bicycles, possibly, the [illegible] cyclist has been driven to the quieter lanes and by-paths. In four years there has been an increase in the total number of vehicles from 14,963 to 18,727.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Billericay R.D.C. (July 23rd. Mr. R. G. Hetherington.)—£9,000 for the purpose of sewerage and sewage disposal.—The scheme, as explained by Mr. J. E. Willcox, of Messrs. Willcox and Raikes, embraces the sewering of the populous portion of the parish of Hutton, together with sewage disposal by means of [illegible] It is designed for extension, so that eventually the sewage from the adjoining parish of [illegible] may also be dealt with at the same outfall works.

Cardiff T.C. (July 28th. Mr. P. M. Crosthwaite).—£[illegible] for a new drink water-service main from Lisvane to the Heath filter beds, and thence to the city, and for additional filtering appliances and storage facilities. There was no opposition to the application.

Deptford B.C. (July 29th. Major J. Stewart).—£1,500 for the erection of washing baths in Ilderton-road, South Bermondsey.—It was explained that there would be 18 baths. The proposed scheme will serve a working-class neighbourhood, not a house in which has a bath.

Evesham R.D.C. (July 31st. Mr. C. H. Eyles).—£[illegible] for the provision of workmen's dwellings. It was explained by the clerk, Mr. H. E. Wadhams, that the council proposed to erect twenty houses, six on ½ acre of land, each to let at 5s. 9d. a week rent, and six at 3s. 6d., four on 2¼ chains of land, each to let at 4s. 3d. a week, and four on 1½ chains of land, each to let at 4s. The area of the site was 7 acres 1 rood 37 poles, and the price £80 per acre. The surveyor and sanitary inspector, Mr. E. Holloway, stated that sixteen houses had been erected in the parish in the last ten years. Early in this year there was overcrowding in eight houses in the village.

Feckenham R.D.C. (July 28th. Mr. C. H. Eyles).—£1,940 for the purchase of land and the erection of workmen's dwellings at Astwood Bank. It was stated that applications had been made for 25 houses, and that the council proposed to erect ten at present. Mr. W. H. Dicks gave details of the plans prepared, and stated that the tenders had exceeded the estimates by £300.

Fleetwood U.D.C. (July 22nd. Mr. F. H. Tulloch).—£1,772 for works of private street improvement.—The necessary details were explained by the surveyor, Mr. E. Frobisher, and in answer to a frontager the clerk, Mr. A. Cottam, stated that the term of the loans to the owners would depend upon the amounts. The inspector stated that the Local Government Board preferred that only five years be given.

Holmfirth U.D.C. (July 22nd. Major C. Norton).—£[illegible] for purposes of water supply, including the construction of a reservoir to hold more than 100,000 gallons, abutting on Greave-road, and £2,427 for works of sewerage.—Mr. H. Barrowclough, the engineer, offered an explanation of the plans of the water scheme, and subsequently of the proposed works of sewerage.

Penzance T.C. (July 17th. Mr. W. O. E. Meade-King.)—£1,350 for the provision of public conveniences at the Morrab Gardens and Alexandra grounds, and for offices and conveniences at the eastern end of the Market House.—It was stated that the council desired to borrow the money for 60 years. The estimate of the work for the public conveniences—which were much needed—was £689, and for the offices at the Market House, £1,125.

Southgate U.D.C. (July 17th. Mr. H. S. Stewart).—£10,465 for the erection of working-class houses at Barrowell Green, Winchmore Hill.—The engineer and surveyor, Mr. C. G. Lawson, stated that it was proposed to erect 100 houses of several classes—seventeen with 16-ft. frontages, at a rental of 8s. a week; eighty-four with three bedrooms, at a rental of 7s. a week; fourteen with three bedrooms, at a rental of 7s. 6d. a week; thirty-one with two bedrooms, at a rental of 5s. 6d. a week; and fourteen tenements with one bedroom, at a rental of 4s. a week. The roads were to be 40 ft. wide. The site was the best to be found in the district, and was near to a school,

the footways and within 5 yards of a railway. Upon the water, gas and drainage facilities were concerned, and there was ample open ground intended solely for the tenants of the cottages.

Stroud U.D.C. (July 29th. Mr. W. O. E. Meade-King).—£1,650 for additions to the public baths, new stables and a roller shed, also the purchase of existing stables in Merry Walks.—The surveyor, Mr. G. P. Milnes, submitted the drawings of the proposed additions to the baths and stables which he had prepared.

Torrington T.C. (July 29th. Mr. H. A. Chapman).—£1,100 for the purchase of land, and the erection of five workmen's dwellings.—It was stated by the town clerk, Mr. G. M. Doe, that the scheme was the result of a visit paid by an inspector of the Local Government Board. The medical officer, Dr. H. C. Parsons, said the site in Well-street was an excellent one, and the surveyor, Mr. W. C. Medland, stated that the estimated price was about £200 per cottage.

Westhampnett R.D.C. (July 23rd. Mr. H. A. Chapman).—£1,330 for the purposes of an inquiry under Part III. of the Housing of the Working Classes Act, 1890, for the purchase of land and the erection of six working-class dwellings at North Bersted. The clerk, Mr. W. D. Rasell, stated that inquiries were made by the surveyor, Mr. L. Bell, and his report showed that it was almost impossible to obtain a house of any description in North Bersted. The proposed rent for each cottage was 4s. 3d. per week, exclusive of water-rate, which would amount to 35d. per cottage per week. The cost of the land, which was freehold, was £260, and the council asked that the loan for that amount should be spread over a period of 80 years. They also asked that the loan for the erection of the cottages should be spread over 60 years.

APPLICATIONS FOR LOANS.

Brighton T.C.—£14,700 for the electricity undertaking, and £3,250 for a woman's hostel in connection with the Municipal Training College.

Cleckheaton U.D.C.—£8,085 for electricity plant.

Cheriton U.D.C.—£3,000 for the purchase of land for the improvement of High-street.

Hebden Bridge U.D.C.—£600, supplemental loan for work at the sewage outfall.

Kidderminster R.D.C.—£439 for the Churchill water scheme.

Luton T.C.—£2,122 for road construction, and £878 for works of sewerage.

Newbury T.C.—£1,000 for a new roof for the corn exchange.

North Riding C.C.—£500 for a cookery and handicraft centre at Thirsk.

Porthcawl U.D.C.—£3,000 for works of sewerage.

Southend T.C.—£400 for paving work.

Wanstead U.D.C.—£14,651 for creosoted wood block paving, and £1,372 for road reconstruction.

Westbourne R.D.C.—£120 for works at the reservoir.

LOANS SANCTIONED.

Aylesbury U.D.C.—£21,323 for the erection of electricity works.

Bournemouth T.C.—£4,261 for public conveniences.

Dulverton R.D.C.—£770 for the Brushford sewage disposal scheme.

Epsom U.D.C.—£5,787 for sewerage and storm-water drainage.

Essex C.C. £5,088 for the purchase of a site for a secondary school at Leyton.

Harrogate T.C.—£6,000 for the enlargement of the Kursaal.

Hull T.C.—£20,000 for conversions to the water-carriage system.

Hungerford R.D.C.—£1,600 for the provision of workmen's houses.

Newbury T.C.—£2,000 for gasworks plant.

FORTHCOMING INQUIRIES.

AUGUST.

		£
10.—**Ilford.**	For works of sewage disposal (Mr. P. M. Crosthwaite) ...	1,600
10.—**Thames Ditton.**	For works of sewerage (Mr. F. H. Tulloch)	580
11. **Bournemouth.**	For the erection of police barracks (Mr. W. O. E. Meade-King)...	3,500
12. **Poole.**	For the purposes of the water supply (Mr. W. O. E. Meade-King) ...	150
12. **Stoke-on-Trent.**	For works of building, paving, and drainage (Mr. R. G. Hetherington)	15,285
13.—**Felixstowe.**	For the provision of a cemetery (Mr. P. M. Crosthwaite)	1,363
13.—**Swanage.**	For the purchase of land for the purpose of a recreation ground (Mr. W. O. E. Meade-King) ...	8,250
13.—**Waltham Abbey.**	For works of paving (Mr. M. K. Neville)	1,750
13. **Wirral.**	For works of sewage disposal (Mr. R. G. Hetherington)	5,928
14. **Teignmouth.**	For the purchase of a motor fire engine (Mr. W. O. E. Meade-King)	775

TOWN PLANNING.

SEPTEMBER.

9. **Hounslow.**	(Mr. Thomas Adams) ...	—

MUNICIPALITIES AND THE WAR.

Yarmouth Town Hall is being converted into a hospital.

Council schools at Grimsby have been taken over as naval hospitals.

The Worthing Urban District Council on Tuesday resolved unanimously to aid dependents of employees called to the colours.

The Salford Corporation has declared its intention of providing adequately for the wives and children of employees called away for service.

At the Lord Mayor's suggestion the Manchester Corporation on Wednesday agreed to allow all Reservists and Territorials in the service of the corporation half-pay while they are serving their country.

SALFORD BOROUGH ENGINEERSHIP.

The Finance Committee of the Salford Corporation have drafted an amended schedule of duties for the position of borough engineer and surveyor, and are recommending the council to invite applicants for the vacant post at a salary of £900 a year, rising to £1,100 per year.

Road Traffic Statistics.—We understand that the Road Board have notified highway authorities in England and Wales that, as any traffic census taken at the present time would not show normal figures, it is considered desirable to postpone the work of census taking in connection with the proposed classification of roads.

Recreation Grounds in Middlesex. As a result of the Middlesex County Council's policy of encouraging local authorities to provide open spaces in the county, since 1897 no fewer than sixty-five recreation grounds, ranging from 1 acre to 172 acres in area, have thus been acquired, the council providing one-fourth of the cost, amounting altogether to £179,48[illegible].

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. net). The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation. *Times Engineering Supplement.*

Motor Traffic and Middlesex Roads.—Mr. H. T. Wakelam, engineer and surveyor for the county of Middlesex, in his annual report states that the heavy motor traffic rendered the improvement of the highways so imperative that during the past year the council had agreed to contribute £146,010 towards resurfacings and widenings, and further expenditure was in contemplation amounting to £372,000, towards which the Road Board has been asked to contribute.

Municipal Work in Progress and Projected.

[illegible] SURVEYOR [illegible] with a view to making information given under this head [illegible] and accurate as possible.

[illegible] Barrow-in-Furness £10,150, Bridlington, Carlisle [illegible] water, gas and electricity—Grimsby £30,000, Walsall [illegible]

BUILDINGS.

Bexley U.D.C.—The surveyor, Mr. W. T. Howes, [illegible]

Bristol T.C.—A scheme has been adopted for increas- [illegible]

Buxton U.D.C.—Improvements are to be carried out [illegible]

Dover T.C.—The borough surveyor, Mr. W. C. Hawke, has received instructions to report on a site suitable for a public mortuary.

Durham C.C.—The council have adopted the scheme [illegible]

East Riding C.C.—The council have sanctioned an [illegible]

Paddington B.C.—The Baths and Washhouses Com- [illegible] tions in favour of (1) the sinking of a well, equipped with steam-driven air-lift plant, (2) the installation [illegible] heaters, and (3) the use of steam-driven electric lighting and power plant, utilising the exhaust steam [illegible] baths, slipper baths and laundry, and warming the atmosphere. Mr. Boaz is of opinion that this arrange- [illegible] efficient and economical installations in the country.

Smethwick T.C.—Plans have been approved for the proposed extension of the hospital for the provision of accommodation for tuberculosis and other pur- [illegible]

Wallsend T.C.—A scheme is mooted for the pro- [illegible]

HOUSING AND TOWN PLANNING.

Derby T.C.—The council last week adopted a town planning scheme submitted by the Improvement Committee.

East Ardsley U.D.C.—A scheme for the provision of twelve workmen's dwellings has been approved.

Eccles T.C.—The council have adopted a housing scheme for the south-east part of the town, the estimated cost of which is £85,686.

Gwyrfai R.D.C.—The council have received the sanction of the Local Government Board to their [illegible] dwellings in the neighbourhood of Ebenezer. The plans were prepared by the council's surveyor, Mr. J. Watkin Thomas, and the work will be carried out under his supervision.

Leeds T.C.—The council last week passed a resolution affirming the expediency of exercising their powers under Part III. of the Housing of the Work- [illegible]

Newport (Mon.) T.C.—The council at their next meeting will be asked to purchase the Somerton [illegible]

PARKS AND OPEN SPACES.

Ilkeston T.C.—The Duke of Rutland has presented to the corporation a piece of land for the enlargement of the cricket ground, and has promised to make all the roads around the ground when required at his own expense.—It has been agreed to make a bowl- [illegible]

ROADS AND MATERIALS.

Antrim C.C. A report from the Public Works Committee has been adopted with respect to the duties of the assistant surveyors. In the Antrim and Ballymena rural districts the work which up to the resig- [illegible] will now be performed by three, and the vacancy caused by the resignation of Mr. Allen will not be [illegible] tricts as follows: To one assistant 347 miles wholly in the Ballymena rural district, to one assistant 364 miles wholly in the Antrim rural district, to one assistant 293 miles partly in Ballymena and partly in Antrim rural districts. The total salary to be paid to these three assistants to be £465 per annum, to be apportioned by us.

Barrow-in-Furness T.C.—It is proposed to make up [illegible]

Bath T.C.—The borough surveyor, Mr. C. R. Fortune, has submitted to the Surveying Committee a report in which he said he had come to the conclusion that the elm blocks had come up to what was expected of them, but that the life could not yet be specified. Three specimen blocks taken from the Old Bridge, High-street, and Charles-street, were submitted for the inspection of the committee, having [illegible]

Boston R.D.C.—There are three district surveyors under the council, and the Highways Committee on Saturday recommended an enlargement of the third [illegible] additional 37 miles of highways forming parts of the parishes of Skirbeck Quarter, Wyberton, Frampton, Kirton, Wigtoft, and Swineshead. The recommendation was adopted, and the salary was fixed at £63, but it was stated that Mr. Eastgate does not give his whole time to the work. Mr. Allen is retiring from the second district, and it was resolved that his successor's salary be £140. The three districts cover 354 miles of road, and the surveyor's [illegible] have worked out at £330, or 18s. 8d. per mile.

Brentford U.D.C.—The tender of the Improved Wood Pavement Company, Limited, [illegible] per 1,000, has been accepted for the supply of 5,000 creosoted fir wood blocks.

Bridlington T.C.—Four schemes have been advanced and are being considered by the Property Committee for the extension of the Royal Prince's-parade and the improvement of the sea front. The proposals include a seaward extension of the parade 100 ft., and the erection of a pavilion to seat 4,000 people. The borough surveyor (Mr. E. R. Matthews) estimates the cost, including the erection of a floral pavilion, at £52,360.

Brighton T.C.—It has been agreed to pay £1,040 for a plot of ground on the west side of Dyke-road, between Melville-road and Addison-road, for the purpose of future street improvement.

Broadstairs U.D.C.—The council have approved the plans of the surveyor, Mr. H. Hurd, for making up part of Pierremont-avenue, at an estimated cost of [illegible]

Carlisle T.C.—The city surveyor, Mr. H. C. Marks, has submitted a report recommending that all the main roads of the city should be made up with tarmacadam, at an estimated cost of £12,500, towards which the Road Board would probably sanction a grant of £4,000.

Hull T.C.—The council have agreed to the proposal of the city engineer, Mr. A. E. White, to lay experimental lengths of [illegible] asphalt on Cottingham-road.

Manchester T.C.—An important report on the question of congested streets and their remedy has been presented to the corporation by Mr. J. Herbert Thewlis, chairman of the Watch Committee, and the chief constable, Mr. Robert Peacock. These gentlemen received authority from the town council to visit London, Paris, Berlin, Dresden, Munich, Ham-

burg, Vienna, New York, Philadelphia, Boston, Chicago, Toronto, and Montreal, and the result of their inquiry is instructed in a most exhaustive report which deals with the subject historically, descriptively, and suggestively. To meet the congestion due to the increase of motor traffic, tramway traffic, and the obstruction caused by insufficient warehouse loading accommodation it is laid down that the minimum width of any street intended to accommodate a fairly heavy volume of traffic should be not less than 60 ft. from kerb to kerb. In addition to widenings, the remedies proposed include the construction of new streets, footbridges, subways, and rapid transit lines, Manchester being deficient in rapid transit facilities for suburban passengers. The suggested remedies calling for increased statutory powers comprise the diversion of traffic, limitation of the use of the streets, a speed limit, signalling, and the removal from the streets in an expeditious manner of vehicles which have broken down.

Plymouth T.C.—Schemes have been adopted for widening up Hoe Park avenue and part of Lockyer street, and [illegible] the old [illegible] for [illegible] the [illegible] of the park.

Poole T.C.—The council have adopted the plan of the engineer, Mr. S. J. Newman, for making up unmade streets under the Private Street Works Act.

Ripon T.C.—It has been decided to remove the old cobble pavement in front of the cathedral, and lay asphalt in its place, at an estimated cost of £40, an amendment that asphalt would destroy the ecclesiastic[illegible] being rejected.

Stockton T.C.—A proposal by the Sanitary Committee that in case the owners of property made default in complying with the notices served upon them under the Private Street Works Act, the borough engineer, Mr. H. Sykes, be authorised to carry out the necessary work, has been rejected in favour of an amendment by a majority for tenders.

SEWERAGE AND SEWAGE DISPOSAL.

Benfieldside U.D.C.—For the new sewage disposal works, designed by Messrs. Taylor & Wallace, civil engineers, of Newcastle-on-Tyne, an order has been placed with Adams-Hydraulics, Limited, for three of their patent "Cresset" sprinklers of 80-ft. diameter.

Horsforth U.D.C.—Another order for a "Cresset" sprinkler of 80-ft. diameter has been placed by the council with Messrs. Adams-Hydraulics, Limited. The surveyor, Mr. H. Brown, is engineer for the scheme.

Llanfyllin R.D.C.—The council have instructed Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, to prepare a sewerage and sewage disposal scheme for Llanfair Caereinion.

Petersfield R.D.C.—According to the amended plans for the Liss sewage disposal scheme, the estimated cost will be increased from £7,250 to £8,750. The scheme has been referred to the Liss Parochial Committee.

Poole T.C.—The council have approved the plans of the council's surveyor, Mr. S. J. Newman, for sewering and surface drainage, estimated to cost £64.

Smallthorne U.D.C.—The council have adopted the recommendation of the Special Committee appointed to deal with the report of the county medical officer of health, that Mr. R. E. W. Berrington (Messrs. Berrington, Son & Watney), of Wolverhampton, be instructed to survey and report on a sewage disposal scheme for the district and separate areas.

WATER, GAS, AND ELECTRICITY.

Bangor T.C.—The council have approved a scheme of improvements and extensions at the gasworks, at an estimated cost of £1,650.

Brynmawr U.D.C.—The surveyor, Mr. J. J. Quirk, has prepared a scheme for the improvement of the water supply, the cost of which he estimates at £3,200.

Castlederg R.D.C.—It has been agreed to carry out the recommendations contained in a report by Mr. W. Stewart, of Strabane, with a view to the improvement of the water supply.

Eastbourne T.C.—The council are recommended by the Electricity Committee to provide new plant for the electricity works, at a cost of £4,000.

Grimsby T.C.—The Lighting Committee recommend extensions of the electricity undertaking, at an estimated cost of £30,000.

Walsall T.C.—Contracts have been entered into for buildings and plant in connection with the erection of new electricity works, the total amounting to £46,786.

Wednesbury T.C.—In connection with the electricity undertaking it has been decided to purchase for £1,086 a 300-kilowatt rotary converter and transformer with switch gear, and that a building to contain the plant be erected on land belonging to the council at Kings Hill, at an estimated cost of £1,400.

MISCELLANEOUS.

Romford R.D.C.—A sub-committee has reported that it would be in the council's interest that the surveyor should be relieved of all clerical work, so far as possible, to enable him to devote his time to the outdoor duties. And as the clerical work is not sufficient to keep a clerk wholly employed, they recommended, and the council agreed, that a clerk with previous office experience, from eighteen to twenty years of age, be appointed at a commencing salary of 18s. to 20s. per week, to undertake the whole of the clerical work under the surveyor's supervision, and to assist the clerk for an allotted period each week.

Salford T.C.—The Tramways Committee propose to borrow £28,073 for the purchase of tramcars. Of this amount £7,640 is for twelve car bodies without covered tops, but with vestibule ends, and £9,560 for twelve car bodies with covered tops and vestibule ends.

PERSONAL.

Mr. J. R. Heath, deputy surveyor of Stoke-on-Trent, has received an advance of salary from £245 to £270.

Mr. J. H. Castle, assistant borough engineer of Bedford, has been appointed surveyor to the Goole Urban District Council.

Mr. W. Granger, assistant surveyor to the Goole Urban District Council, has been appointed chief assistant to the borough surveyor and water engineer of Loughborough, at a commencing salary of £120 per annum.

Mr. William Brodie, M.INST.C.E., brother to Mr. J. A. Brodie, M.INST.C.E., city engineer of Liverpool, has been appointed principal assistant to the dock engineer under the Mersey Docks and Harbour Board. Mr. Brodie was one of the short-list candidates for the position of engineer-in-chief when Mr. A. G. Lyster retired, and he has been associated with dock work throughout his professional career.

Mr. A. E. White, city engineer of Hull, has resigned on account of the failing health of himself and his wife. He has been in the service of the corporation for thirty-six years, and for twenty-eight years has held the office of city engineer. Mr. White's letter of resignation was read, in the first instance, at the meeting of the Works Committee, the chairman of which, Alderman Larard, said he felt Mr. White had always carried out his duties with the greatest ability, honesty and zeal. They all deplored the fact that he thought the time had come when, on account of his health and that of his wife, he should tender his resignation. A motion of regret at Mr. White's resignation was passed.

FOR OTHER ADVERTISEMENTS

See End of Paper.

LANGPORT RURAL DISTRICT COUNCIL

ISLE BREWERS WATER SUPPLY.

CLERK OF WORKS

Wanted for a period of about two months during the laying and jointing of the new Cast Iron Mains and House Connections.

The person appointed will be required to act under the instructions of the Council's Engineer and Surveyor.

Applications are to be sent to the undersigned, and intending applicants are requested to observe that only persons having previous experience of the laying of water cast-iron mains need apply.

Wages Two to Three Guineas per week, according to experience and suitability.

JOS. MATHISON, F.S.I.

Langport.
July 31, 1914. (1,840)

WILLESDEN DISTRICT COUNCIL.

APPOINTMENT OF ASSISTANT ROAD SUPERINTENDENT.

The Willesden District Council invite applications for the position of Assistant Road Superintendent.

Applicants must not be less than thirty, and not more than forty-five years of age, and with some experience as to the maintenance of highways.

Applications, in candidate's own handwriting, stating nature of present employment, with copies of not more than three recent testimonials, to be delivered to the undersigned not later than 4 p.m. on Tuesday, August 25, 1914.

The salary will commence at 3½ guineas per week. A conveyance for travelling will be provided by the Council.

The person appointed will be required to devote his entire time to the duties of his office, and the appointment will be determinable by a month's notice upon either side.

(By order)

C. CLAUDE ROBSON,
Engineer to the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.

August 5, 1914. (1,844)

RURAL DISTRICT COUNCIL OF MERE.

APPOINTMENT OF HIGHWAY SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council require the services of a competent person as Highway Surveyor and Inspector of Nuisances.

The appointment will be an annual one in each case, and the latter subject to the sanction of the Local Government Board.

The salary as Highway Surveyor will be £100 per annum and as Inspector of Nuisances £50 per annum.

The District comprises 10 parishes, and there are 33 miles of Main Roads and 22 miles of District Roads.

The person appointed will be required to perform the duties of designated officer within the meaning of the Housing (Inspection of District) Regulations, 1910, and Inspector under the Factory and Workshop Act, 1901.

Candidates must be competent to prepare all plans and specifications for works in connection with the highways and improvements thereon, and must be conversant with the requirements of the Highway and Sanitary Acts.

Security in £100 will be required.

Applications, stating age, qualifications, and experience, with copies of three recent testimonials, must reach me not later than 11 a.m. on Monday, the 24th August.

Selected candidates will have notice when and where to attend.

(By order of the Council)

R. HOWARD HISCOTT,
Clerk.

Council Offices,
Mere, Wilts.

August 3, 1914. (1,841)

RURAL DISTRICT COUNCIL OF CLUTTON.

STEAM ROLLING.

Tenders are invited for the Steam Rolling and Scarifying required on the Main and District Roads in this District during the year ending 30th September, 1915.

The mileage of the main roads is about 44 miles, and of the district roads about 190 miles.

Specifications and Forms of Tender may be obtained from the undersigned, to whom Tenders, endorsed "Steam Rolling Tender," must be delivered not later than 8th September, 1914.

The Council do not bind themselves to accept the lowest or any Tender, and the acceptance of any Tender will be subject to the person tendering entering into and paying for a Contract to be approved by the Council.

J. SUMNER DURY,
Clerk to the said Council.

Temple Cloud,
Bristol.

August 5, 1914. (1,843)

BARNET URBAN DISTRICT COUNCIL.

TAR-MACADAM.

Tenders are invited for Providing and Laying Tar-macadam in Wood-street, Barnet, of an average thickness of 4 in., and of a superficial area of about 6,400 super yards, on the following terms:

(1) That the cost be spread over 18 months from completion of the work, in three equal payments.

(2) That the work be guaranteed for 2 years, free of cost.

(3) That the paving be maintained for an additional 3 years at a cost to be stated per yard super.

The Council will prepare the surface of the road for the reception of the Tar-macadam.

Full particulars can be obtained upon application to Mr. W. B. Chancellor, Engineer and Surveyor, No. 40 High-street, Barnet.

Quotations, endorsed "Tar-macadam," accompanied with a full description of the stone proposed to be used, together with samples of the same, in an untreated and treated state respectively, must be addressed to me and delivered at the Council Offices, No. 40 High-street, Barnet, on or before the 24th August, 1914.

The lowest or any Tender will not necessarily be accepted.

H. W. POOLE,
Clerk of the Council.

July 29, 1914. (1,846)

WOODFORD URBAN DISTRICT COUNCIL.

FIRE ALARMS.

The Council invite Tenders for the Installation and Maintenance of the "Knight" System of Street Fire Alarms.

Particulars may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Fire Alarms," to be sent in not later than noon on Tuesday, 18th August.

The Council do not bind themselves to accept the lowest or any Tender.

WILLIAM FARRINGTON,
Surveyor.

Council Offices,
Woodford Green. (1,845)

OGMORE AND GARW URBAN DISTRICT COUNCIL.

RECONSTRUCTION OF SEWERS, BLAENGARW —CONTRACT No. 2.

The Ogmore and Garw Urban District Council is prepared to receive Tenders for the Construction of a Culvert formed of Brickwork and Concrete, and the Construction of certain lengths of Sewers and Surface-water Drains formed of Cast-iron and Stoneware Pipes of 9 in. in diameter, together with Manholes and Connections, in accordance with the Drawings and Specifications prepared by John Taylor & Sons, civil engineers.

Contractors desirous of tendering may obtain copies of the Specification and Bill of Quantities, with Form of Tender, from the offices of the engineers, Caxton House, Westminster, S.W., upon payment of £5 (cheque only), which will be returned upon receipt of a *bonâ-fide* Tender. The Drawings may be inspected either at the offices of the engineers, or at the surveyor's offices, Council Offices, Brynmenin, Glam.

Tenders, endorsed "Blaengarw Sewerage—Contract No. 2," must be delivered to the Clerk to the Council, S. H. Stockwood, Esq., solicitor, Bridgend, before 12 noon on Friday, the 21st day of August, 1914.

The Council do not bind themselves to accept the lowest or any Tender. (1,842)

BOROUGH OF CHEPPING WYCOMBE.

Tenders are invited for a Two-cell Refuse Destructor with Water-tube Boilers.

Particulars may be obtained from the undersigned, to whom Tenders must be addressed, endorsed "Destructor," not later than Monday, the 24th August, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

T. J. RUSHBROOKE,
Borough Surveyor and Engineer.

25 Easton-street,
High Wycombe.

August 5, 1914. (1,839)

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain.
Each man's opinion freely is his own
Concerning anything, or anybody.
— Massinger. "The Fatal Dowry," Act ii., 2

THE DUTY OF MUNICIPAL ENGINEERS.

To the Editor of The Surveyor.

Sir,—A question which seems to me of the greatest [illegible] is the extent to which the officials of public [illegible] are bound to the State.

Could the [illegible] supply, the lighting, the scavenging, and other municipal services in case of need, so that if, unhappily, the occasion arose he would not find himself unprepared? Cannot he ascertain if the roads and bridges under his charge are capable of withstanding the strain of troops, baggage wagons, and heavy guns making use of them?

Should he not carefully consider how he can assist the military authorities in the selection of temporary camping grounds, and the best methods for the supply of water and the removal of the "waste products" [illegible]

Would he not be the best person to advise as to the choice of buildings which might be the most convenient for temporary hospitals, in case of need?

Would not his local knowledge be of the greatest value in settling these and many other points that might arise; and would it not strengthen the status of the profession if the surveyor, when the time comes, was discovered to have already made himself master of these various problems?

It would certainly be helpful if surveyors made suggestions through the medium of The Surveyor as to the manner in which practical help could be given.—Yours, &c.,

H. P. B.

August 5, 1914.

A GOOD EXAMPLE.

To the Editor of The Surveyor.

Sir,—I have the pleasure to inform you that the Metropolitan Board, at a special meeting held to-day, passed the following resolution:—

"That any officer or servant of the board who, as a member of the Territorial or other Reserve (Naval or Military) Forces of the Crown, may be affected by the mobilisation or embodiment consequent on the present European crisis, be allowed leave of absence during his naval or military service; that he be reinstated on his return with no loss of position or emoluments consequent on his enforced absence; that the board pay him (or such other person or persons as he may appoint) during such period such sums as, with the pay he receives from the Government, will make up his full salary or wages; and further that the respective committees be authorised to make such temporary arrangements as may be necessary for carrying on the work of such officers and servants in their absence."—Yours, &c.,

A. B. Pilling,
Clerk of the Board.

August 4, 1914.

"FIRES AND FIREFIGHTERS."

To the Editor of The Surveyor.

Sir,—May I be allowed to inform your readers that Mr. Dan Kenlon's "Fires and Firefighters" has been withdrawn from sale owing to the unauthorised and unacknowledged use of material collected by the British Fire Prevention Committee? When I published the book, the plates of which were made in America, I was not aware of the obligation under which the author stood to the committee, to whom I have expressed my regret for the occurrence.—Yours, &c.,

Wm. Heinemann.

2021 Bedford Street, W.C.,
July 28, 1914.

Assoc.M.Inst.C.E. Examination.—"W. G.," who asks us to furnish him with a short list of suitable text-books for this examination, is referred to the replies to Question 89 in our issues of June 17th and 24th, 1910.

SOME RECENT PUBLICATIONS.*

Trout in Lakes and Reservoirs. A Practical Guide to Managing, Stocking and Fishing. By Ernest Phillips. Price 2s. 6d. nett. London: Messrs. Longmans, Green & Co.

It will come as a surprise to most readers to learn the extent to which our public reservoirs are used for fishing purposes. Mr. Phillips gives a list of over 150 reservoirs containing fish, from most of which the municipality or water authority derive an income produced from the sale of day tickets or of season tickets permitting the holder to fish in the waters. Much information is given that will be of considerable value to those who have control of large reservoirs. The growth of reservoir fishing, and the advantages of stocking reservoirs with fish are dealt with very fully, and much valuable advice is given as to the stocking of reservoirs, the best variety of trout for the purpose, and similar matters. Practical advice to the angler also forms an important part of the book. When it is remembered that such towns as Birmingham, Edinburgh, Bristol, Leeds, Liverpool, and Manchester cultivate fish, and encourage the public to fish in their reservoirs, it is clear that the matter deserves the attention of the water engineer, to whom the book is to be commended.

The Law of Forestry. By Benaiah W. Adkin. Price 8s. 6d. London: Sweet & Maxwell, Limited.

A certain counsel, "learned in the law," once lent a standard work ("Chitty on Contracts") to a friend (not a lawyer), who, in returning it, remarked that it seemed to consist of "platitudes and cases." Whatever justice there may have been in that criticism, certainly no such complaint could be made with respect to this treatise on "The Law of Forestry." Mr. Adkin tells us in his preface that he felt it would be unwise to write for members of the legal profession alone, and that he has endeavoured to write so that the book may be useful to land owners, land agents, and others who may be interested in the management of landed estates. Hence, although there are references to about 600 cases and 120 statutes, and though there is no lack of thoroughness in the presentment of the law, nevertheless, neither the historical, the practical, nor the human aspects of the subject are ignored, as is too commonly the case in the ordinary law book. The very interesting introduction touches briefly on the obsolete laws of the forest (reaching back to early Norman times), the new proposals for afforestation (not yet embodied in legislation), the meaning of forestry, the unsatisfactory condition of British woodlands, and the possible remedies for that condition, and forest systems; concluding with "legal definitions," or rather explanations of the sense in which the law uses certain words relating to forestry—a sense often very different from that attaching to these terms in ordinary language.

The main work is divided into two parts. Part I., on the Law Relating to Trees (the principal subject), naturally bulks considerably larger than Part II., on the Law Relating to Trespass and Game. The former expounds the meaning of the term "timber" in its technical sense, and treats at considerable length of timber estates, the ownership of trees, the rights therein as between adjoining owners, tenants for life and remaindermen, landlord and tenant, copyholders and the lord of the manor, heir and executor, vendor and purchaser, mortgagor and mortgagee, &c. There are also chapters on tithes and other outgoings, the rating of woodlands, trees in relation to highways, injury to trees, and the law of forestry in Scotland and Ireland.

The second part treats of property in birds and animals, sporting rights, and the law of trespass and game in the three kingdoms.

We can cordially recommend the work to all who are interested, whether as students or practically, in what Mr. Adkin well terms "the fascinating science of forestry."

Claridge's Asphalte is being used on the roofs of the new County Hall, Northallerton, and Sledmere Hall, near Malton.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

NORTHAMPTON AND EAST MIDLAND ASSOCIATION OF MUNICIPAL ENGINEERS.

[illegible] of the above [illegible] held at Northampton on the 29th ult. [illegible] and visiting [illegible] works.

At a committee meeting held at the [illegible] the hon. secretary, Mr. Walton Maughan, reported that, [illegible] had been [illegible] A vote was accorded to [illegible] for his services.

The members present were received by the president, Mr. Alfred Fidler, M.INST.C.E., borough engineer and surveyor of Northampton, and he and [illegible] of the district engineers to the association, the various works in hand which were subsequently to be visited. The points and specialities of the Bridge-street widening and improvement works, which are now being carried out at a cost of about £90,000, the Far Cotton and Kingsthorpe tramway, equal to about 7 miles of single track, extensions to the car sheds, the new South Bridge, and workmen's dwellings were first examined. At [illegible] also of interest was a scheme for [illegible] by means of a radio-telegraph water-level recorder, which is being constructed under the patent of Mr. J. E. W[illegible], A.M.INST.C.E., gauge of the water in the various reservoirs of the town situate in various parts of the county.

[illegible] subsequently, the members first of all went to the new South Bridge, which has been [illegible] and [illegible] by Mr. Fidler at a cost of [illegible] £[illegible]. This bridge is of classic design, and [illegible] Derbyshire stone. It consists of three spans over the river Nene, and the [illegible] in width, is paved with Enderby setts and provided with a double line of tramway track. The tramways and widening works in Bridge-street were next visited, and the company [illegible] the earlier process of making a Thermit joint. Afterwards the party divided, and some members visited various works of interest in the town, [illegible] the new workmen's dwellings which have recently been put up under Mr. Fidler's supervision. One type of these, which has [illegible] per house, was the subject of special interest.

A further meeting of the association will be arranged in the course of a month's time, and the hon. secretary, Mr. Walton Maughan, Northampton, will be pleased to hear of anyone wishing to become a member. Members [illegible] continued to [illegible] professional men in the district engaged in either civil or municipal and [illegible] meeting.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. Pickering, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. Dudley Robinson, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.MECH.E.

Next Council Meeting.—The next meeting of the council will be held in London, in September, on day to be arranged.

SOUTHERN & SOUTH-EASTERN DISTRICTS.

A visit to the above districts will be paid to the South Metropolitan Gas Company's works at Tunnel-avenue (near end), East Greenwich, on Thursday, August 13th, at 2 p.m., by kind permission of the company. (Meet at corner of Greenhill-street and Tunnel-avenue.)

EASTERN AND NORTH-EASTERN DISTRICT.

A visit will be paid to Hunstanton on August 15th, 16th and 17th.

There will be no business or other meetings, and ladies and friends of members (including family parties) are specially invited. It will form purely a trip to the seaside, with the opportunity for members to meet on a purely friendly footing.

G. Belson Chilvers,
Hon. District Secretary.

Oundle, Northants.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. Wyand,
Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

DISTRICT SURVEYOR.—August 8th. Pewsey Rural District Council. £90 per annum.—Mr. Robert Dixon, clerk.

INSPECTOR OF NUISANCES.—August 10th. Bolton-upon-Dearne Urban District Council. £120 per annum.—Mr. J. L. Hawksworth, clerk.

SEWAGE WORKS MANAGER.—August 10th. Thurrock, Grays and Tilbury Joint Sewerage Board. £140 per annum.—Mr. C. Asplen, clerk, 59 High-street, Grays.

SECOND ASSISTANT SURVEYOR.—August 12th.—Heston and Isleworth Urban District Council. £100 £120 per annum.—Mr. J. G. Carey, engineer and surveyor, Council House, Hounslow.

SURVEYOR AND COLLECTOR.—August 14th. Wapentakes and Manby Commissioners of Sewers. £150 per annum and commission.—Mr. Frank C. Hett, clerk of sewers, 11 Bigby-street, Brigg, Lincs.

COUNTY SURVEYOR'S ENGINEERING ASSISTANT.—August 17th.—County Council of Salop. £3 3s. per week.—Mr. A. T. Davis, county surveyor, County Buildings, Shrewsbury.

COUNTY SURVEYOR.—August 19th.—Longford County Council. £250.—The Secretary, County Council Office, Longford.

CHIEF ENGINEERING ASSISTANT.—August 20th. Corporation of Bedford. £150 £200 per annum.—Mr. N. Greenshields, borough engineer and surveyor, Town Hall, Bedford.

TEMPORARY SURVEYOR'S ASSISTANT.—August 27th.—Isle of Thanet Rural District Council. £2 2s. per week. Mr. Chas. Taylor, clerk, Board Room, Minster, near Margate.

CLERK OF WORKS.—August 27th. Fleet (Hants) Urban District Council. £4 4s. per week.—Mr. W. H. Wright, clerk.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LONDON.—September 7th. Designs for two new schools, for the London County Council.—The Clerk, Spring-gardens, London, S.W.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

GILDERSOME.—Plans for twenty houses at prices from £200 to £270, for the urban district council.—Mr. W. Wilby, surveyor, Council Offices.

TOTTENHAM.—Designs for the erection of a school for 900 scholars, for the Tottenham Education Committee.—Mr. W. Mallinson, clerk, Education Offices, Philip-lane, South Tottenham, N.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* **The Surveyor** *office by noon on* **Wednesdays** *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BENTLEY.—August 10th.—For the erection of 100 houses, for the urban district council.—Mr. R. G. Whitley, surveyor.

GLASGOW.—August 10th.—For masons' and concrete work for the proposed approach to art galleries, for the corporation.—Office of Public Works, 64 Cochrane-street.

KEIGHLEY.—August 11th.—For the erection of a cemetery chapel, for the rural district council.—Mr. T. Burton, surveyor.

ARMAGH.—August 11th.—For sinking and tubing well at Clonman, and cleaning out the tubing well at Keltylea, for the rural district council.—Mr. H. C. Parkinson, engineer.

FOLESHILL.—August 11th.—For the erection of thirty workmen's dwellings, for the rural district council.—Mr. A. E. Newey, engineer and surveyor.

SOUTHALL-NORWOOD.—August 11th.—For the removal of old buildings and alteration to manor house, for the urban district council.—Mr. R. Brown, engineer and surveyor.

MELTON MOWBRAY.—August 12th.—For the erection of a bridge, for the rural district council.—Mr. A. H. Marsh, clerk.

LITTLEHAMPTON.—August 12th.—For the erection of a public lavatory, for the rural district council.—Mr. H. Howard, surveyor, Town Offices.

BERWICK.—August 13th.—For the erection of a valve-house at reservoir, for the sanitary authority.—Borough Surveyor.

ARDSLEY.—August 14th.—For the erection of twelve houses, for the urban district council.—The Surveyor, Blackgates Council School, Tingley.

DURHAM.—August 15th.—For the erection of six pavilions at sanatorium, for the county council.—County Surveyor, Shire Hall, Durham.

KIRKCALDY.—August 15th.—For alterations and additions to the fire station and the erection of a shelter, for the corporation.—Burgh Surveyor.

HARROGATE.—August 15th—31st.—For additions to the Kursaal, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

ROCHFORD.—August 17th.—For the erection of four cottages, for the rural district council.—Mr. O. C. Madge, surveyor.

EVESHAM.—August 17th.—For the erection of thirty workmen's houses, for the rural district councils of Evesham and Pebworth.—Mr. E. H. Wadams, clerk, Union Offices, Evesham.

BRISTOL.—August 18th.—For the erection of public baths, for the corporation.—Mr. L. S. McKenzie, city engineer and surveyor.

BARNET.—August 19th.—For the erection of twenty-four cottages, for the rural district council.—Mr. A. J. Wilshire, surveyor, Shenley-road, Boreham Wood.

HERTS.—August 20th.—For the erection and completion of a new special subjects centre at Stevenage, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

BARNSLEY.—August 21st.—For the erection of an open-air school, for the Education Committee.—Mr. E. W. Dyson, architect, Regent-street, Barnsley.

EASTRY.—August 24th.—For the erection of six cottages, for the rural district council.—Messrs. Jennings & Gray, 4 St. Margaret's-street, Canterbury.

TREDEGAR.—August 24th.—For the erection of a fire station at Harcourt-terrace, Tredegar, for the urban district council.—Mr. W. Edgar Jones, architect, 1 Commercial-street, Tredegar.

ST. AUSTELL.—August 25th.—For the erection of thirty-two workmen's dwellings, for the rural district council.—Mr. W. H. Moffat, surveyor.

LANCASHIRE.—August 28th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribbleshead-place, Preston.

ABERTILLERY.—August 26th.—For alterations and extensions to a school, for the Education Committee.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

GWYRFAI.—August 28th.—For the erection of thirty-six workmen's dwellings, for the rural district council.—Mr. J. W. Thomas, surveyor, 22 Castle-place, Carnarvon.

SHEERNESS.—September 7th.—For the demolition of engine house at Queenborough pumping station and the construction of a new engine-house and other works, for the urban district council.—Mr. E. W. S. Stanton, engineer, 3 Victoria-street, Westminster, S.W.

Iron and Steel.

FRINTON.—August 11th.—For the supply of 450 ft. of steel pipes for sea outfall sewer, for the urban district council.—Mr. E. M. Bate, surveyor.

MANCHESTER.—August 15th.—For the supply of nine 7-in. hydraulic valves and fittings, and 296 tons of cast-iron hydraulic pipes, and special castings, for the corporation.—Mr. Thomas Hudson, town clerk.

KEIGHLEY.—September 5th.—For the supply of cylinders for reservoir works, for the corporation.—Mr. M. R. Barrett, engineer, Town Hall.

Roads.

HALIFAX.—August 8th.—For constructing about 1,310 super. yds. of Durax, Kleinpflaster, or similar granite paving, for the corporation.—Mr. J. Lord, borough engineer.

ALFRETON.—August 10th.—Offers for a steam roller built by Messrs. Aveling & Porter in 1893.—Mr. R. F. Ward, surveyor.

BENTLEY.—August 10th.—For making up new streets, for the urban district council.—Mr. G. Whitley, surveyor.

ROTHWELL.—August 10th.—For the supply of 5,912 super. yds. of best quality granite setts, for the urban district council.—Mr. J. Southwart, surveyor.

PORT GLASGOW.—August 10th—17th.—For causeWaying and other work, for the corporation.—Burgh Surveyor.

LONDON.—August 11th.—For paving with creosoted wood-blocks, for the county council.—Mr. G. W. Humphreys, County Hall, Spring-gardens, S.W.

GOSFORTH.—August 11th.—For forming approach roadway and erecting wood and iron netting, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

BELFAST.—August 11th.—For paving and sewering streets for one year, for the corporation.—City Surveyor.

MOUNTAIN ASH.—August 11th.—For the execution of private street works, for the urban district council.—The Surveyor.

HASTINGS.—August 12th.—For the supply and laying of about 2,600 sq. yds. of limestone tar-paving in various streets in the borough, for the corporation.—Mr. P. H. Palmer, borough engineer.

LEEDS.—August 12th.—For works of paving and flagging, for the corporation.—Highways and Permanent Way Department, 155 Kirkstall-road, Leeds.

NEWPORT (Mon.).—August 12th.—For the execution of private street works, for the corporation.—Borough Engineer.

HASTINGS.—August 12th.—For laying 2,600 sq. yds. of limestone tar-paving, for the corporation.—Mr. P. H. Palmer, borough engineer.

ROCHDALE.—August 12th.—For making up certain streets, for the corporation.—Borough Surveyor.

AXMINSTER.—August 13th.—For road improvement works, for the rural district council.—Mr. G. A. Millard, surveyor.

BUNGAY.—August 14th.—For the supply of 345 tons of 1½-in. and 5 tons of 1-in. best broken granite, for the urban district council.—Mr. P. J. Sprake, clerk.

EPSOM.—August 24th.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

BARNET.—August 21st.—For [illegible] for the urban district council.—Mr. W. E. [illegible], engineer and surveyor.

LISSINGTON.—September 1st.—For [illegible] for the rural district council.—Mr. [illegible], surveyor.

BRIGHTON.—[illegible] for the [illegible] and channels, for the [illegible] Borough Surveyor.

Sanitary.

HUNSWORTH.—August 10th.—For the [illegible] for the urban district council.—Mr. [illegible], surveyor.

SLAWTON.—August 10th.—For the collection and removal of refuse, for the corporation.—Mr. H. [illegible], consulting engineer.

BIRMINGHAM.—August 10th.—For the [illegible] about 71 miles of [illegible] city engineer and surveyor.

[illegible].—August 11th.—For the [illegible] council.—Messrs. Chapman & Snape, engineers, Newcastle-under-Lyme.

ST. MELLONS.—August 11th.—For laying about 370 [illegible] works, for the rural district council.

THORNHILL.—August 12th.—For the construction [illegible] Committee.—Messrs. Crouch, Hogg & Easton, 14 Blythswood-square, Glasgow.

SOUTHAMPTON.—August 12th.—For the construction of surface-water drains at Cosham, near Portsmouth, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

ASHBY-DE-LA-ZOUCH.—August 13th.—For laying pipe sewer with manholes, for the rural district council.—Mr. S. Turner, surveyor.

TADCASTER.—August 14th.—For the construction of about 160 yds. of 6-in. sewer, with manholes, for the rural district council.—Mr. H. M. Driver, surveyor.

DENTON.—August 15th.—For the construction of twelve new circular percolating filters, together with humus tanks, automatic dividing chambers and other works in connection therewith, for the urban district council.—Mr. J. B. Cooke, engineer and surveyor.

COWBRIDGE.—August 17th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. S. Morgan, 23 Gelliwastad-road, Pontypridd.

HENDON.—August 17th.—For sewerage and other works, for the urban district council.—Mr. S. S. G[illegible].

CHERTSEY.—August 18th.—For the construction of two circular bacterial filters, 80 ft. diameter, containing a total of 2,248 cub. yds. of destructor clinker; also small humus tank with pipes and appurtenances, for the rural district council.—Messrs. Elliott & Brown, Burton Buildings, Parliament-street, Nottingham.

FLEET.—August 20th.—For the construction of about 16 miles of stoneware and cast-iron sewers, brick, concrete, and cast-iron manholes, flushing tanks, ventilating shafts and columns, cast-iron rising mains, air mains, engines, compressors, ejectors, and other works incidental thereto, for the urban district council.—Mr. T. J. Moss-Flower, engineer, 28 Victoria-street, Westminster, S.W.

MARTLEY.—August 20th.—For the construction of 2¼ miles of 9-in. and 6-in. sewers, with manholes, lampholes, sedimentation tanks, bacterial filters, humus tank, sludge beds, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

RUNCORN.—August 21st.—For the construction of sewers and sewage disposal works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

TOTTINGTON (Lancs).—September 1st.—For the provision and laying of about 8,060 lin. yds. of cast-iron and stoneware pipe sewers, manholes and [illegible] chamber, and tanks, and the construction of sedimentation tanks, percolating filters, humus tanks, sludge beds, channels, and diversion of stream course, [illegible] council.—Mr. L. Kenyon, engineer, Bolton.

ALEXANDRIA.—December 8th.—For the construction of a [illegible] for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

HAMPTON.—August 11th.—For the supply of Portland [illegible], [illegible] and [illegible] valves, and timber, for the urban district council.—Mr. S. H. Chambers, surveyor.

Miscellaneous.

TWICKENHAM.—August 12th.—For the supply of a [illegible] with fire engine, complete with pump, [illegible] hose, and [illegible] equipment, for the urban district council.—Mr. F. W. Pearce, engineer and surveyor.

MIDDLETON.—August 18th.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. F. Entwistle, town clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BRADFORD.—For the construction of a circular outfall sewer in tunnel, for the corporation.—Mr. J. Watson, Town Hall.—

J. Best & Sons, Limited, Edinburgh, £121,616.

CHELMSFORD.—For paving Duke-street with creosoted deal blocks, for the corporation.—Mr. P. T. Harrison, borough engineer.

Acme Flooring and Paving Company, Limited, London, N.E., £2,219.
J. Mowlem & Co., Limited, London, S.W., £2,236.
Improved Wood Pavement Company, Limited, London, E.C., £2,193.
W. Griffiths & Co., Limited, London, E.C., £2,163.*

CHELMSFORD.—For the supply of cast-iron pipes for water mains, for the corporation.—Mr. T. P. Harrison, borough engineer:—

3-IN., 4-IN. AND 6-IN. AT PER CWT.

J. Needham & Sons, Limited, Stockport, 6s. 9d., 6s. 9d., 6s. 6d.*
Stanton Ironworks Company, Limited, Nottingham, 6s. 11d., 6s. 9½d., 6s. 8d.
Staveley Coal and Iron Company, Limited, Chesterfield, 7s., 6s. 10½d., 6s. 9d.
Clay Cross Iron Company, Limited, Chesterfield, 7s. 0½d., 6s. 10¾d., 6s. 9½d.

AT PER TON.

Sheepbridge Coal and Iron Company, Limited, Chesterfield, £6 16s., £6 13s. 6d., £6 11s.
Cochrane & Co., Limited, Dudley, £6 18s. 6d., £6 16s., £6 13s. 6d.
J. Oakes & Co., Limited, London, E.C., £6 19s., £6 16s. 6d., £6 14s.
Holwell Iron Company, Limited, Melton Mowbray, £7, £6 17s. 6d., £6 15s.

HEMEL HEMPSTEAD.—For the erection of fourteen cottages, for the rural district council.—Mr. T. H. Lightbody, surveyor:—

Payne Brothers, Leavesden	£3,563
A. Timberlake, Kings Langley	3,425
Harrowell Brothers, Chesham	3,362
J. Ray, Letchworth	3,360
W. W. Sears, Leverstock Green	3,262
T. Higgs, Northampton*	3,118

MONMOUTHSHIRE.—For the construction of a new road, for the county council.—Mr. W. Tanner, county surveyor, Newport, Mon.:—

G. Davies, Ystrad Mynach, Glam.	£2,693
J. B. Packer, Hengoed, Glam.	2,259
Williams Brothers, Bedwas	2,150
J. Sutherland, Abercynon, R.S.O., Glam.	2,018
H. Smith, Newport, Mon.	1,950
J. Harry, Radyr, Glam.	1,932
Lewis Brothers, Dinas Powis, Glam.	1,843
W. Jones, Llanbradach, Glam.	1,677

SAFFRON WALDEN.—For additions to hospital, for the Joint Hospital Board.—Mr. H. R. Bird, architect, Old Broad-street, E.C.:—

Harris Brothers, Billericay	£4,157
W. Bell & Sons, Saffron Walden	3,957
J. L. Glasscock & Sons, Bishop's Stortford	3,725
F. W. Jarvis, Brentwood	3,699
Parren & Son, Earith, Hunts	3,584
D. Robinson, Stansted	3,465
J. Custerson, Saffron Walden	3,437
Kidman & Sons, Cambridge	3,293
Rooke & Sons, Cambridge‡	3,190

SOUTH SHIELDS.—For the construction of sewers, for the corporation.—Mr. L. Roseveare, borough engineer:—

G. Thornton & Co., South Shields, £280.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

AUGUST.

15-17. Institution of Municipal Engineers. Visit to Hunstanton.

SEPTEMBER.

19. Institution of Municipal and County Engineers. Meeting at Cleethorpes.

26. Institution of Municipal and County Engineers. Meeting at Scarborough.

OCTOBER.

9. Royal Sanitary Institute. Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for lower despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH OF BEDFORD.

CHIEF ENGINEERING ASSISTANT.

Applications are invited for the appointment of Chief Engineering Assistant in the Borough Engineer and Surveyor's Department.

Candidates must have had experience in a Municipal Engineer's Office, and possess a thorough knowledge of Surveying, Levelling, Building Works, Private Street Improvement Works, Building Bylaws, and General Office Routine.

Age 25 to 35. Salary £100 per annum, rising by annual increments of £10 to a maximum of £200.

Applications, in candidate's own handwriting, stating age, qualifications, together with full particulars of experience, and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than Thursday, August 20th, 1914, endorsed "Chief Engineering Assistant."

Canvassing is strictly prohibited, and will be deemed a disqualification.

N. GREENSHIELDS, ASSOC.M.INST.C.E.,
Borough Engineer and Surveyor.

Borough Engineer and Surveyor's Office,
Town Hall,
Bedford.
July, 1914. (1,821)

COUNTY COUNCIL OF SALOP.

Wanted, immediately, in the County Surveyor's Department, an Engineering Assistant, for Road Improvement Work, at a salary of £3 3s. per week.

Candidates must be competent Surveyors and Levellers, proficient Draughtsmen, capable of designing ordinary county works, and preparing specifications for same, and experienced in the routine work of an Engineer and Surveyor's Office, and especially in the keeping of the prescribed forms and accounts connected with Road Board grants.

Applications, on Forms to be obtained from the undersigned, stating age, training, qualifications, present employment, and past experience, accompanied by copies of not more than three testimonials of recent date (which will not be returned), and endorsed "Assistant," must be received by the undersigned not later than Monday, August 17th, 1914.

A. T. DAVIS,
County Surveyor.

County Buildings,
Shrewsbury. (1,831)

CONTRACTOR'S AGENTS required, with Civil Engineering experience. Salaries from £250 to £350. Apply, in writing, to the Secretary, Anglo-Mexican Petroleum Products Company, Limited, Finsbury-court, London, E.C. (1,809)

ASPHALTE PLANT.—Engineering Firm, specialising in the manufacture of this, require the active services of a gentleman with £3,000 to extend. Splendid opportunity, owing to New Road Making methods. Present machinery working to fullest extent and orders being refused, early deliveries being impossible.—Box 1,450, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,823)

URBAN DISTRICT COUNCIL OF FLEET, HANTS.

FLEET SEWERAGE AND SEWAGE DISPOSAL WORKS.

CLERK OF WORKS

[illegible] about 14th September, 1914.)

The Council invite application for the above appointment. Candidates must be thoroughly experienced in the construction of modern Sewage Disposal and Drainage Works, and able to efficiently discharge the duties required of Clerk of Works on works of this kind, and must be competent with the use of the level and theodolite, and be able to set out and measure works. No others need apply.

He will be required to act under the direction of Mr. T. J. Moss-Flower, C.E., Engineer for the Works.

Salary £4 4s. per week.

Time about 18 months, subject to approved services.

Applications, marked "Clerk of Works," stating any previous experience, and enclosing copies of three recent testimonials, to be sent to the undersigned not later than three o'clock on Thursday, 27th August, 1914.

W. H. WRIGHT,
Clerk to the Council.

Council Offices,
Fleet, Hants. (1,834)

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.

SECOND ASSISTANT SURVEYOR.

The above Council are prepared to consider applications for the appointment of Second Assistant in the Engineer's and Surveyor's Department. The person to be appointed must be a good Draughtsman and Surveyor, and possess practical knowledge of the work of a Municipal Engineer's Office. Preference will be given to candidates who hold the diploma of the Institution of Municipal and County Engineers, and who have had experience in the preparation of Plans, Specifications, Estimates and Quantities. Age not to exceed 28 years. Salary £100 per annum, rising, subject to satisfactory service, by annual increments of £10 to a maximum of £120.

Applications, on Forms to be obtained from Mr. J. G. Carey, ASSOC.M.INST.C.E., Engineer and Surveyor, Council House, Hounslow, together with copies of three recent testimonials, to be sent to the undersigned not later than noon on Wednesday, the 12th August, 1914, endorsed "Second Assistant Surveyor."

Canvassing will be deemed a disqualification.

(By order)
H. J. BAKER.
Clerk to the Council.

Council House,
Hounslow,
30th July, 1914. (1,827)

TEMPORARY SURVEYING ASSISTANTS.

Required, in the Office of a Borough Surveyor to a County Borough, two temporary Surveying Assistants to carry out work of referencing owners and preparing plans for an extensive Town Planning scheme. Preference will be given to applicants who have had experience in the work of Town Planning. The persons appointed will have to devote the whole of their time to these duties.

Applications, stating age, experience, qualifications, and salary required to be sent to Box 1,452, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,837)

ENGINEERING AND TOWN PLANNING ASSISTANTS.

Wanted, two Engineering Assistants for Municipal Office of large City in the North. One, expert in Town Planning, Surveying, Contouring, and Laying Out of Garden Cities. The other, experienced in the Laying Out of Sea Fronts (pier, sea walls and groynes), and capable of taking part in the General Engineering Work of the City.

Apply immediately, stating age, full particulars of training, present appointment, and salary required, *not to exceed £3 per week.*

Apply Box No. 1,453, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,836)

ISLE OF THANET RURAL DISTRICT COUNCIL.

[illegible] Town Planning Scheme [illegible] nected with Town Planning.

[illegible] undersigned. When completed it should be returned to me not later than the 13th instant. The appoint- [illegible] 27 [illegible]

Canvassing strictly prohibited.

(By order of the Council)

CHAS. TAYLOR,
Clerk.

[illegible] Road, Margate, near Ramsgate.
August 1, 1914. (1,835)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SHEERNESS URBAN DISTRICT COUNCIL.

SHEERNESS WATERWORKS

CONTRACT No. 8

TO BUILDERS AND CONTRACTORS.

The Sheerness Urban District Council invites Tenders for the demolition of the Beam Engine-house, &c., at the Trinity-road Pumping Station, and for the construction of a new Engine-house and other works on the site thereof.

Plans may be seen, and copies of the Specification, Bills of Quantities and Form of Tender obtained, on and after Tuesday, the 4th August, either at the office of the Engineer, Mr. F. W. S. Stanton, ASSOC.M. INST.C.E., 3 Victoria-street, Westminster, S.W., or at [illegible] Offices, Hall-road, Sheerness, on payment of Two Guineas (cheques only), which will be returned [illegible]

[illegible] from the printers on production of a signed permit to them, but such prints must be delivered to the [illegible]

[illegible] and the site of the work [illegible] Resident Engineer at the Pumping Station.

Sealed Tenders, endorsed "Tender for Sheerness Water [illegible] on or before Monday, the 7th September, 1914.

Parties tendering must do so at their own expense.

The Council does not bind itself to accept the lowest or any Tender.

(By order)

VINCENT H. STALLON,
Solicitor,
Clerk of the Council.

Council Offices,
Sheerness.
July 27, 1914. (1,838)

COUNTY BOROUGH OF HASTINGS.

TO TAR-PAVING CONTRACTORS.

The Corporation are prepared to receive Tenders for the Supplying and Laying of about 2,600 square yards of Limestone Tar Paving in various Streets in the Borough.

Specifications and Forms of Tender may be obtained at the Office of the Borough Engineer, P. H. Palmer, Esq., M.INST.C.E., Town Hall, Hastings, during office hours.

Sealed Tenders, endorsed "Tender for Tar Paving," to be delivered to me by 12 o'clock noon on the 12th day of August next.

The Corporation do not bind themselves to accept the lowest or any Tender.

BEN. F. MEADOWS,
Town Clerk.

Town Hall, Hastings.
July 25, 1914. (1,830)

SWIMMING BATHS WATER PURIFICATION.

IMPORTANT TO MUNICIPAL AUTHORITIES:

Is the water in the Swimming Ponds under your control **always** clear, free from any dullness, and equally bright and attractive **at all times?**

Are the bathers satisfied they can obtain equally good conditions of bathing **every day?**

Is the water free from all **brown stain?** Can you distinctly see a hairpin lying on the bottom of the pond at the deep end?

Unless these questions can **all** be answered in the affirmative, why not adopt our System of Purification, whereby we will guarantee to fulfil all the above conditions with complete success? At the same time the cost of water saved annually will in a few years pay for the plant.

By our System of **Treatment** and **Sterilization** of the water, not only is its Chemical and Bacterial Purity maintained, but freedom from all **disease-germs** is absolutely ensured.

Send us Architect's plans of the baths, and we will furnish Estimates and Plans of the apparatus free. Please at the same time refer to our guarantee.

WRITE FOR PAMPHLET

THE "TURN-OVER" FILTER CO.,
39 CHICHESTER STREET,
BELFAST.

Or Messrs. J. BLAKEBOROUGH & SONS,
BRIGHOUSE.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. AUGUST 14, 1914. No. 1,178.

Minutes of Proceedings.

The Romance of Road Making. In the course of a recent research among back volumes of The Surveyor we noticed that our issue of July 21, 1899, contained a paper by a former borough surveyor of Wolverhampton in which there were some interesting references to "The Literature of Road and Street Construction." It occurred to us, while glancing at this paper, that any future bibliography of road making might very well include some references to the more purely literary, imaginative and poetic aspects of the subject. For example, in Isaiah xl. 3, 4 and 5 we read: "The voice of him that crieth in the wilderness, Prepare ye the way of the Lord, make straight in the desert a highway for our God. Every valley shall be exalted, and every mountain and hill shall be made low: and the crooked shall be made straight, and the rough places plain; And the glory of the Lord shall be revealed, and all flesh shall see it together: for the mouth of the Lord hath spoken it." Here the imagery is undoubtedly derived from the road engineering work which was the necessary preliminary to the progress of a powerful Oriental despot and his retinue through a wild and unfrequented region. In a flat country, of course, and for a merely temporary purpose, the work would be chiefly of a surface nature, in which the "valley" to be "exalted" would be no more than a hollow to be filled, and the "mountain and hill" no more than a hump to be removed. Passing from the Old Testament to the New, and from thence to our own times, it was from the Vulgate Latin version of John xiv. 6 that Dr. Guglielminetti took his inspiring, though incomplete, motto, "Via Vita." We call it incomplete because there is every reason for retaining the connecting "Veritas" of the alliterative Latin version. In plain English, "way" is not "life," nor the means of life unless it is both made and used with "truth." Otherwise, the way itself may be too treacherous to bear the traffic, and the traffic may be that of death-dealing "road hogs," or invading armies, instead of the traffic of civilising commerce and friendly, humanising intercommunication. In this connection Kipling's fine lines may afford a good English motto for the road surveyor, the civil and the civic engineer: "Keep ye the Law—be swift in all obedience. Clear the land of evil, drive the road and bridge the ford." In fiction there is the excellent novel by Mr. A. W. E. Mason entitled "The Broken Road," the said road being, if we remember rightly, somewhere in India. And if, at this time of serious public and private anxiety, any road surveyor or road engineer can command sufficient leisure and calmness of spirit to indulge in a little light reading of a sentimental but harmless—and possibly even helpful kind—he might do worse than peruse "Her Grace Duchess Annabel," a story by "Betty Beggs," contained in the *Family Herald Supplement*, bearing to-day's date, but really published a week ago. The hero is a red-haired giant who answers to the honest plebeian name of "John Smith." He is a Colonial, but as to whether he is a Canadian or an Australian the authoress betrays a rather unnecessary and almost ludicrous incertitude. His profession, however, is left in no such uncertainty, for he is a road surveyor. The heroine, a wealthy dowager duchess of thirty, by birth and breeding Irish, and unconventional, is thus addressed by her jealous cousin, Lord Buzzant: "You are one of the greatest ladies in England. Smith is a road surveyor—neither more nor less—a man with a paltry five hundred a year, who spends his life camping out in the wilds. The thing is impossible—it is preposterous!" Nevertheless, "the thing" she contemplates comes to pass, and the story has a happy ending, not because John Smith is an expert at "levelling," but because of the fine human qualities of himself and the duchess. Far be it from us even to appear to emulate the callousness of Nero, who fiddled whilst Rome was burning; and unmarried, unengaged surveyors will not need to be told that they cannot all wed dowager duchesses, even if they wished to do so, for they will know that there are not enough of the latter to go round. We must not idly dream either of an irrevocable past or an unlikely future; we must act and be ready to act in the living present. Our fighting forces are much in evidence just now, and, if necessary, most of us—without distinction of age or sex—would risk all to preserve our national existence. But it is significant and encouraging to find a woman novelist taking as her hero, not a military or naval officer, but a man of peace, a creator rather than a destroyer, "a road surveyor—neither more nor less."

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The Importance of Geology. Among the subjects which should be included in the general training of every civil engineer, no matter to what special branch of the profession he intends to devote himself, one of the most important is undoubtedly that of geology; and perhaps this applies with peculiar force to the municipal engineer upon whose advice may depend the success or otherwise of underground water supplies, the economical execution of works of sewerage, and many other works the cost of which is largely determined by the nature of the geological materials met with in the course of excavation either in trench or tunnel. It must also be remembered that some knowledge at any rate of the geology of building stones, road metals, and other similar materials ought to form part of a complete technical equipment. Dr. Herbert Lapworth therefore did well to emphasise the importance of a study of geology in the paper on "Applied Geology in Municipal Engineering," which he read at the recent annual meeting and conference of the Institution of Municipal and County Engineers at Cheltenham. Most municipal engineers are familiar with that type of dispute with contractors which arises from some misunderstanding in regard to the nature of the ground in which the work is located.

As Dr. Lapworth pointed out there are [illegible] causes of this kind of trouble. It often arises from providing intending contractors with inadequate or misleading descriptions of the strata in which the work is to be executed, the information given being usually derived from trial holes or borings; but perhaps an equally frequent cause is the adopting under a contract of a type of construction unsuited to the kind of ground unexpectedly encountered in the trenches or foundations. In either case the engineer with a practical working knowledge of geological phenomena is less likely to fall into error. Dr. Lapworth gave an interesting example of a dispute which was the direct result of sinking trial holes clear of the line of the work. The trial holes, in order to save expense, were sunk in a railway cutting parallel to the sewer. These proved the ground to consist entirely of sandstone and conglomerate, whereas at least half the length of the tunnel was found to be in marl, the discrepancy being due to the cross dip of the strata. In the sandstone and conglomerate the tunnel was driven without timber, while in the marls close timbering was required throughout owing to falls from the sides and roof.

In regard to water supply, in addition to a knowledge of geology, a firm grasp of the principles of hydro-geology is also necessary in order that the engineer in the course of his investigations may utilise to the full, and with some approach to scientific accuracy, the data which he obtains from local wells and springs in determining the underground water resources of the district, and in taking precautionary measures to avoid the pollution of the supply. In ordinary sewer construction, perhaps, the geological considerations are more simple, although they become more important as the depth of the excavation increases. Where, however, questions of surface protection and the purchase of underground minerals arise, a sound knowledge of local geology and its practical bearing on the possibility of subsidence is of very real consequence. We are glad to observe that Dr. Lapworth did not conclude his valuable paper without a reference to the desirability of placing the occurrence and petrology of road stones upon a scientific basis. A good deal of very useful work has been done in this direction in recent years, and the tribute paid to the early labours of Lovegrove, Howe, and Flett was well deserved. This pioneer work has since been supplemented in many directions, and a great deal is still being done. The importance of the subject is such, however, that we ought not to rest satisfied until—to use the concluding words of Dr. Lapworth's paper—with the establishment of courses in highway engineering at the universities, so strongly urged recently by Mr. H. Percy Boulnois, scientific research in this direction may be stimulated, and in conjunction with the practical results and experiments of road engineers, a new technology, for which there seems to be a considerable need, may be evolved.

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War and the Surveyor's Duty.

It is a matter for congratulation that there are a number of municipal and county engineers who hold commissions in various branches of the Territorial Forces. Their duties are clearly assigned to them. For those who remain at their civil posts there is much that can be done to assist the country in the greatest crisis that has confronted it since the time of Napoleon. As we have already pointed out, they can at once arrange, if they have not already done so, for the protection of our water supplies and other municipal works. They can study their districts, and be ready to advise the military authorities on points of detail if they are called upon to do so. They can look to their roads and bridges and satisfy themselves that these are strong enough to withstand the movements of troops, guns, baggage, and so forth, which at any moment they may be called upon to bear, and, if not, decide what temporary measures can be adopted at short notice to strengthen them. But, in addition to these obvious duties, there may come a time, and that not very distant, when there may be unemployment and distress on a very large scale, when relief works will be urgently required. The municipal engineer should be fully prepared for this emergency, and should at once set to work to discover what suitable works in his neighbourhood could be carried out. Unfortunately, ordinary road construction work is not for the unskilled labourer, except as regards a very small proportion of it, at any rate; but there may be road improvements in connection with which a considerable amount of excavation, or filling in, may be necessary, and for such work any man capable of wielding a pick and shovel is more or less useful. There may be old quarries or depressions which could be filled in and levelled; there may be work in the public parks requiring manual labour. In some localities works of sea defence might be commenced; in others land reclamation is a work where an enormous amount of unskilled manual labour can be employed. There are some districts in which derelict canals exist and could be filled in and the land used for agricultural purposes; or, if found better, these might be drained and prepared for electric light railways. Although breaking stones by hand is unpopular, as it savours of the workhouse, a very large amount of unskilled labour could be usefully employed in this direction. There are very few depots which do not contain a large accumulation of spalls and waste material which could be broken up by hand and used for the "bottoming" of roads and streets as required, although it might be unsuitable for surfacing. There are no doubt many other relief works which might be suggested from local knowledge, but the point to be urged is that every surveyor throughout the country can do much at the present crisis to relieve the strain when it comes. To be prepared and not to have to act in a panic is the sure road to success, and no doubt every municipal and county official throughout the land is at the moment doing his best to assist the nation in its present critical situation.

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The Government's Example.

The Government are giving an excellent lead in regard to the principle of giving relief through work rather than charity. Thus, the Office of Works have stated publicly that they intend to proceed with all services in their charge, to employ as many men as possible to carry out such services, and to develop and expedite their building programme in any way practicable. As the Minister mainly responsible for Government building, the First Commissioner of Works has expressed his sincere hope that private individuals, companies, firms, and contractors will spare no effort to follow the policy of the Government in this matter, so far as circumstances admit. We understand, too, that an official circular has been issued to the local Emergency Relief Committees which are being formed under the direction of the Cabinet Committee on Distress, urging upon them and upon the local authorities the importance of pushing forward public works as a means of preventing unemployment. A certain obligation, too, rests upon the Development Commissioners and the Road Board, for the Act under which these bodies were constituted provides that in approving, executing, or making advances in respect of any work under the Act involving the employment of labour on a considerable scale, regard shall be had so far as is reasonably practicable to the general state and prospects of

employment. It appears probable, therefore, that the coming winter will witness much activity in the [illegible] and the trades which business depends upon has brought [illegible] industry are likely to experience less disturbance of business than might at first have been anticipated. At all events, [illegible] neglecting reasonable precautions, they, in [illegible] will probably [illegible] may well be [illegible] "in their quiet ways."

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Technical Education.

Much has been written from time to time concerning the relative advantages of a college training and the serving of a term of pupilage as a preparation for entrance to the engineering profession. Any criticism which we ourselves have made upon this rather vexed question has been to the effect that the ideal to be aimed at is the perfect union of theory with practice. If the purely college-trained engineer is apt to be pedantic, he still has considerable advantages over the man who is so "practical" that he has no intellectual apprehension of anything beyond mere rule of thumb. Whatever opinions may be held upon the general question, however, there can be no doubt as to the excellence of the provision that is being made by some of the newer universities for the education of the new generation of engineers. A pleasing and satisfactory feature of some of the schemes of study which have been devised is the recognition of municipal engineering as a separate and distinct branch of the profession, of such importance as to merit the holding of special classes and the conferring of special diplomas. As an example of this we may mention the University Courses in the Manchester Municipal School of Technology, a copy of the prospectus of which is before us. This school has developed from the Manchester Mechanics' Institution, founded in 1824, until to-day it is of university rank, and attracts students from all parts of the world. The university courses just referred to include first, second, and third year courses in municipal and sanitary engineering leading to the degrees of Bachelor and Master of Technical Science. The first year course appears to be designed principally to lay a good foundation in those subjects which are applicable to all branches of the engineering profession, while the work over the whole period is so planned as to afford a proper combination of theoretical training with laboratory practice and drawing office experience. Another syllabus of which we have received a copy is that of the Faculty of Engineering at University College, London. This is of special interest, because the course in municipal enginering is under the direction of Mr. E. R. Matthews, ASSOC.M.INST.C.E., the recently appointed Chadwick Professor. The subjects of instruction here include water supply and waterworks construction, sewerage and sewage disposal, lighting, roads, street paving, and tramways, and town planning from an engineering aspect. It will be seen from the foregoing that the opportunities for systematic technical training are better at the present time than ever before, and it behoves the youthful aspirant to honours in the engineering profession to keep a good lookout and to seize every chance which comes within his range of equipping himself for the thoroughly efficient discharge of his future duties.

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An Important Decision.

In our last issue we noticed a decision of a Select Committee of the House of Commons which may form a precedent of a far-reaching character. The point arose upon the consideration of a Bill the object of which was to provide the town of Weston-super-Mare with an improved water supply, and it had reference to the liability, as between the county council and the urban district council, for the cost of moving certain water mains in the event of the necessity arising owing to alteration or improvement of the main roads under which they were laid. The county council asked for the insertion of a clause providing that in such cases the expense should be borne by the district council, and the Committee unanimously decided to amend the Bill so as to secure this end. The general policy of the Public Health Act, 1875, with regard to this matter as between a local authority and a company is that the former must not only bear the cost of any necessary removals, but that no alteration of a company's works which will permanently injure the pipes, mains, plugs, or works, or prevent the water from flowing as freely and conveniently as usual shall be required or made. To this provision, however, there is a proviso to the effect that where, under any local Act of Parliament, the cost of removal is directed to be borne by the company, their liability shall continue, notwithstanding anything contained in the general Act. It will be seen, therefore, that the effect of the decision on the Weston-super-Mare Bill is that the district council will be placed in a position analogous to that of a company to which the proviso just quoted applies. It would appear that the point is one which ought to be settled once and for all on principle, instead of being dealt with piecemeal in individual Bills. Our own view is that the placing of mains under highways is a privilege, and that any cost to the public involved by it should be borne by those who desire the benefit. If the Weston decision became stereotyped, effect would be given to this view.

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The Kempston Surveyor's Extra Services.

A lively imagination is an excellent thing when it is directed in the proper channel, but it is obviously an undesirable quality when it is used for the purpose of depriving a professional man of that which is properly due to him. At a Kempston (Beds) Urban District Council meeting recently the Sanitary Committee submitted a recommendation to pay the surveyor, Mr. A. H. C. Inskip, £70 for extra services in connection with the sewerage scheme. Upon this Mr. Kenealey, drawing upon what the chairman, Mr. H. S. Deacon, described as "a lively imagination," proceeded to harrow the feelings of his fellow members by a series of assertions of a highly sensational description. Seventy pounds was, he said, "a terrible sum to be asked to pay suddenly" for services the details of which had not been given; all the more so as the liabilities of the council at the present time were "tremendous." Then, emphasising the high note of fervid alarmism, he proceeded to quote figures, and concluded by inquiring, fearfully, "where were they going to get the money from?" When all this exaggerated diction was submitted to the test of sanity and candour by the chairman, it appeared that the Sanitary Committee had given the matter "most careful consideration;" that Mr. Inskip had been engaged upon the understanding that his duties would entail two days' work a week; that the surveyor was given extra work to do; that he had drawn plans, arranged easements, attended to maintenance work, flushed chambers, sunk trial holes, and fixed the positions of 700 junctions along the mains; and finally that the surveyor had saved the council a great deal of money. After such an explanation it was, of course, admitted by an overwhelming majority of the council, they being reasonable men, that it was a matter of obligation on their part to recognise, however inadequately, the services rendered by Mr. Inskip. There is really no accounting for how far some people will go when under the influence of a "lively imagination."

Modern Methods of Road Construction.

By [illegible], Engineer and Surveyor to the Leyton Urban District Council.

[illegible] real use all will admit, but unless expressed concisely they lose value, while, unfortunately, in con[illegible] ideas are circulated of which it may truly be said [illegible] reasonably upon the subject, and the minds of many [illegible] have been misconceptions.

We know that bituminous roads are replacing w[illegible] like to admit it or not, that the initial cost is still the leading factor which governs the introduction of any method into a fresh district. As to the value of the various methods, there is doubtless, as so often stated, room for all; but the surveyor wants to know what are the points that should be considered the dominating factors of each and every method, and doubtless the collection and tabulation of these factors in the order of their respective merit and importance is the main object of your request for contributions to your special issue dealing with the subject.

I therefore venture to suggest two points which, in my opinion, should stand at the head of your [illegible] been advanced by abler and more experienced writers than myself, but which have neither separately nor conjointly received the attention which is their due.

Waterproofness.—What modern method is there [illegible] commencement or has remained so over a period [illegible]

Resiliency.—What method either satisfied this requirement when first laid down, or has retained it satisfactorily in summer and winter, or over a period of two or three years?

If a road is not waterproof, it cannot retain its resiliency; if it is not resilient it cannot retain a smooth and regular surface under present-day traffic. The water-bound macadam road is doomed on these two factors alone.

How wearisome the recent lengthy discussion upon different methods of construction, when all the time we knew they failed in respect of one or both of these requirements! The waterproofing by surface treatment with tar was so marked an advance upon the old, dusty, water-bound road that I am afraid the public Press and some others rather overstepped themselves, and later, when we were presented with the idea of an inch asphalt carpet laid on our old macadam roads, it was in some circles assumed that the Millennium had come; yet in the busy suburban streets of Greater London we find that surface treatment on our heavily trafficked roads disappears with the swallows, and the resilient carpet fails in use over defective patches in the old foundations. Moreover, some methods of construction held to be suitable for light traffic have been found to cost nearly as much as other methods found suitable for heavier traffic, and, of course, much more for maintenance.

The Road Board have given us standard specifications for tar-macadam and pitch-macadam. Does tar-macadam meet the requirements of both the factors I have laid down? If so, for how long will it last—until its nature becomes as brittle as pitch? [illegible] Stone grouted with Trinidad bitumen matrix will meet both requirements, but that is more than can be [illegible] of the bitumens that are now being [illegible] Why have we no standard specification for bitumen?

Given proper and reliable materials, the municipal [illegible] best way to make his roads, and no doubt there will be many good ways. The following specification [illegible] cost, suitable for the hard wear and tear of 'bus traffic, and capable of maintenance at from 2d. to 3d. per square yard per annum. Its waterproofness and resiliency have been retained, while endeavouring to stiffen the lower part of the crust to minimise internal attrition and distribute the shocks of vehicular traffic more uniformly over defective portions of the old foundation.

This road also preserves what I am told by many [illegible] a dominant factor a reasonably good foothold for horses.

Specification for 35 yds. Upper or Roadway.

(1) Scarify and roll the road, and, if very dry, lightly water.

(2) Take 5 tons of granite broken to 1½-in. gauge, 2½ tons granite chippings (½-in. to dust), and twelve bags of Ferromac; mix with a solution of calcium chloride (35 lb. calcium chloride to 50 gallons of water) to form concrete, and spread evenly over foundation.

(3) Spread immediately and evenly over above 9 tons of granite broken to a 2-in. gauge.

(4) Lightly roll and consolidate to surface shape.

(5) Heat 4 tons of Trinidad bitumen matrix to 450 deg. to 500 deg. Fahr., and well squeegee over surface.

(6) Cover with ⅜ in. screened granite chippings, and well roll with steam roller.

Cost.

No. of item.		£	s.	d.	Pence per yd.
2	[illegible] tons broken granite, 1½-in. gauge, at [illegible]	5	0	0	5.60
	[illegible] tons chippings, at 10s. 6d.	1	6	11	2.15
	12 bags Ferromac, at 5s. 6d.	3	6	6	3.78
3	4 tons granite, 2-in. gauge, at 12s.	6	6	0	10.08
5	4 tons Trinidad bitumen matrix, at 63s. 6d.	12	14	0	20.32
6	[illegible] tons chippings [illegible] at 11s. 6d.	[illegible]	3		1.38
	Labour, 9 days, at [illegible]	2	5	0	3.60
	Cartage, coal and [illegible]	1	5	0	2.00
	Rolling		13	0	1.04
		£62	3	2	51.15

A FEW WAR HINTS TO SURVEYORS.

(By a Correspondent.)

See that your roads are free from unrolled metal or loose stones; remember that the soldiers' feet are [illegible] as [illegible] rifle.

See that your road direction posts are legible, and if not put up printed ones to serve temporarily; on the march a wrong turning may throw a body of troops out of action.

Be able to advise any officer where the best "halts" can be found on the line of march. These halts should, if possible, be shaded, have grass verges where the men can lie down, and where they can "ease themselves" if necessary. Be able to advise also as to the positions of the best temporary camping grounds in the neighbourhood. These should not be too far from a [illegible] water supply, remember that troops on the march suffer terribly from thirst. The surveyor could arrange with the inhabitants of villages through which the soldiers march to line the sides of the road with jugs and cans of water ready to hand to the men as they pass, recovering the vessels as they are emptied. No humane commanding-officer could object to this so long as the ranks were not broken or the men stopped in their marching.

Remember that a very dusty road is a cruel punishment to soldiers on the march, especially to those in the rear of a column. How this can be prevented must be left to the ingenuity of the local surveyor.

Institution of Municipal and County Engineers.

THE CHELTENHAM MEETING: GENERAL ENGINEERING SUBJECTS.

(Conclusion.)

With the matter appended we bring to a close our report of the roads and general engineering sections of the annual meeting of the Institution of Municipal and County Engineers at Cheltenham. We have yet to record the proceedings of the Housing and Town Planning Conference held in connection with the gathering, and the various papers which were presented at the several sittings of the conference will be reproduced as opportunity offers, with reports of the discussion which followed their reading.

APPLIED GEOLOGY IN MUNICIPAL ENGINEERING.

By Herbert Lapworth, D.Sc., F.G.S.

Few municipal engineers of to-day can fail, after much experience, to realise the importance of practical geology in the construction of their works. The success of underground water supplies, whether attained by knowledge, trial and error, or by a stroke of luck, is admittedly dependent in each case upon the local geology. In works of sewerage, again, the cost may be largely influenced by the nature of the geological materials met with in the trenches and tunnels producing, as they may do, difficulties and expense in excavation, timbering, dealing with ground water, and modification in the design and construction of the permanent work. The same general principles apply to all deep excavations or foundations that may be carried out by the municipal engineer, whether in the construction of new roads with deep cuttings, sea, river and retaining walls, bridges, reservoirs, sewage tanks, or large buildings. The geology of building stones, road metals, and similar materials, though in a lesser degree, is of importance in all those branches of municipal work in which they are constantly employed.

One of the most striking factors that has forced applied geology upon the attention of the engineer has been the number of disputes which have arisen between contractors and municipal authorities concerned almost solely with the "nature of the ground" encountered during construction of public works. A few of these cases have been taken to the courts, some to arbitration, while others have been privately settled. In most instances the cause of the dispute has been due to some misunderstanding as to the "nature of the ground," or, in other words, the geology of the excavations, and almost invariably the ultimate result has been costly.

Frequently this kind of trouble has been the result of providing intending contractors with inadequate or misleading descriptions of the strata obtained from trial holes or borings. Another cause has been the enforcing under the contract of a type of construction unsuited to the kind of ground unexpectedly encountered in the trenches or foundations.

Quite outside the question of legal disputes, however, serious difficulties have arisen, and heavy expense has been incurred by locating works in bad ground, either through lack of previous geological investigations, or by wrong deductions from haphazard exploration, when such troubles might have been avoided in the original location or largely anticipated by investigation with practical geological knowledge.

It is a remarkable fact that this branch of engineering, common as it is to all classes of the profession and on which so much frequently depends, is so strangely ignored in our own engineering literature, and until recently so little considered in the scientific training of civil engineers. Thus, we find in our engineering text-books the most minute mathematical investigations of structures, more or less without relation to the varying geological materials on or in which they may be placed.

As a minor example, retaining walls, the dimensions of which, other things being equal, depend entirely upon the geology, water-bearing nature, and dip of the materials to be supported, are subjected to detailed mathematical analysis which may, in the drawing office, be slavishly applied to practice by arithmetical and graphical calculations, without any knowledge of the ground in which the walls are to be built.

To a limited extent the design of tunnel and sewer sections, for example, in "good" and "bad" ground are considered in text-books, but no account is given of the many types of material met with underground under varying conditions, nor of the principles of the occurrence of underground water, the great variation in cost, and the difficulties of construction under different geological conditions. Under "earthwork" we find the usual tables of slopes, prismoidal formulæ, and the like, but practically nothing on the highly important subject of "slips," or treatment of soft, unstable or "bad" ground.

It may be argued, and rightly, that these are matters of actual practice and experience; but this does not excuse the failure of these treatises to impress the student with the great variation in cost and difficulties of engineering construction in different deposits, and the fact that efficiency and economy in construction might be as much the result of geological knowledge and investigation as of skill and experience in calculation and design. In some degree this void in the engineering text-books is due to the extreme complexity and variation in the physical properties of the geological deposits, which render them incapable of mathematical analysis.

Another inconsistency is sometimes to be seen in the letting of large contracts, where we may have items in the schedule of quantities amounting to only a few shillings, yet the contractor may be wholly ignorant of the character of the ground in which the works are to be constructed, and may, in consequence, under-estimate by several thousand pounds the cost of excavation.

The causes which have contributed to the scant consideration of practical geology among engineers are not easy to determine. Probably the chief of these is the fact that, whatever geological difficulties do arise during construction, it is always possible to complete engineering works, whether economically or not, without geological knowledge, and the engineer is not likely to be blamed by his employers for what turns up unexpectedly below ground.

Secondly, there is a pessimism among certain engineers, some of whom, though they may be experienced in excavation work, have little time for geology, and see only a comparatively heterogeneous mass of deposits underground in no sort of order, and to be classified broadly into two types—"rock" and "muck." There is also the optimist, who expects the geologist, by surface indications alone, to prophesy precisely what will be met with in almost every yard of his proposed trench, and, in consequence, loses faith in the accuracy and practical application of the science.

Thirdly, we have scant consideration of the subject in the engineering and geological text-books. The former have already been discussed; the latter, while containing all the necessary elements for the study of the subject, rarely present the applied or practical side of the science, except on the very broadest lines, and include matter that is unnecessary to learn, and which has rarely any direct bearing upon engineering questions.

In the writer's opinion, every civil engineer should be familiar, first, with the elements of geology—*i.e.*, the principles of stratification, and formation of rocks and deposits, and the various structures occurring in them as the result of formation, change, weathering, or earth movements. He should be able to recognise and describe correctly all the common solid rocks and unconsolidated deposits. He ought also to understand a geological map as he does a working drawing, and be able to plot approximate geological sections from it, as well as accurate geological records from borings, trial holes, trenches and tunnels. A training in petrology is desirable for the road engineer, but expert knowledge in this branch of geology usually requires more time than the professional engineer can afford. A thoroughly practical geological training, however, cannot be acquired without considerable experience in the field.

Of equal importance is the subject of hydro-geology. This includes the principles of the occurrence of

[illegible] underground [illegible] in different [illegible] the line of the [illegible] and [illegible] and [illegible] The [illegible] of this subject [illegible] by [illegible] engineers, but, so far, the quantitative results have been of little direct application to practice, owing to the [illegible] of underground conditions. Nevertheless, the principles arrived at are of great [illegible] in [illegible] conditions [illegible] to speculate or prophesy, and to deal more rationally with underground-water problems where a certain amount of local information has already been secured. The value of this science is not only found in questions of water supply, but in the excavation of trenches, cuttings, deep foundations, tunnels, drainage, and the like.

It would be impossible in a paper of this kind to cover the whole of that region in municipal engineering on which practical geology has a direct bearing. The following are merely a few selected instances commonly occurring in practice.

PRELIMINARY GEOLOGICAL INVESTIGATIONS ON IMPORTANT WORKS.

In the majority of important public works it is desirable to ascertain, by means of trial holes or borings, the nature of the ground in which the works are to be constructed. The object of these investigations [illegible] secondly, the ground-water levels; thirdly, whether [illegible] if practicable; and, lastly, to enable contractors to make a fair tender for the cost of construction. As regards the latter, it has given rise to discussion among engineers whether data obtained from trial holes and borings should be shown to tendering contractors, because of the possibility of future claims or litigation. Information of this kind, however, allows a contractor to put in a fairer price, and avoids the necessity of his protecting himself, as he often does, by increased prices for unknown ground. Without such knowledge, a contractor's tender must usually be either unfair to the municipal body or the contractor himself; but there are pitfalls, of course, although the more practical geological knowledge there is brought to bear on the investigation, the less will be the risk.

As regards the selection of sites for borings, &c., it is essential that the number of holes should be sufficient to give reliable information, and the strata must be correctly described. Each hole should be sunk to the full contemplated depth of the excavation, and located on the centre line, or within the limits of, and not outside, the work itself.

An interesting example of the result of sinking trial holes clear of the work occurred recently in this country in connection with a tunnel sewer. The trial holes, in order to save expense, were sunk in a railway cutting parallel to the sewer. These proved the ground to consist entirely of sandstone and conglomerate, whereas at least half the length of the tunnel was found to be in marl, the discrepancy being due to the cross dip of the strata. In the sandstone and conglomerate the tunnel was driven without timber, while in the marls close timbering was required throughout owing to falls from the sides and roof. An action was brought by the contractor against the public authority on the basis that misleading information had been supplied to him.

In the solid rocks the selection of the sites for trial holes, &c., can often be much assisted by a knowledge of the surface geology. This is especially applicable to tunnel work and the like; but the majority of municipal works are founded close to the surface, and the nature of the ground is dependent more on the character and depth of the soils, subsoils, and surface deposits of the districts. As the detailed structure and arrangement of the surface deposits cannot be foretold with any accuracy from surface indications, trial holes or borings are essential.

WATER SUPPLY.

It is, perhaps, in questions of water supply, and especially in schemes from underground sources, that a sound knowledge of geology and hydro-geology is essential. The selection of a site for a well or boring, which will yield a satisfactory amount of pure water, requires intimate acquaintance with the local geology, the order, arrangement and structure and water-bearing characters of its various strata, both as regards its solid rocks and superficial deposits. Familiarity with hydro-geological principles will also assist the investigator in analysing more rationally from data in local wells and springs the existing underground water resources of the district, and in considering questions of possible pollution from farms, fields, cesspits, cemeteries and polluted streams. Similar principles apply largely to water supplies from springs.

Geological considerations are also highly important in the selection of sites for impounding and service reservoirs, dams and embankments, and in the location and construction of lines of aqueduct, pipes and tunnels; but these are matters, perhaps, more usually in the domain of the consultant, dealing with large schemes, than in the routine work of municipal engineers. . . .

LINES OF SEWERS AND PIPES.

In the construction of lines and sewers we find many questions arising where applied geology may be of use in location, design and construction. The most serious difficulties are generally encountered in the unconsolidated deposits of alluvial, glacial, and other recent origin. The beds of clay, silt, mud, running sand and peat, which so frequently occur in these formations, are usually capable of supporting only relatively low pressures, and require great skill and experience in the treatment of cuttings or excavations, being especially liable to slips, and to act as a semi-liquid when their existing stability is disturbed by any excavation within their mass. Occurring, as they do, in the low-lying areas in valley bottoms, estuaries, and mud flats, they are liable to be saturated with ground water, which further reduces their stability, and adds greatly to the difficulties of engineering construction. In addition to the obviously waterlogged ground formed of these deposits in low-lying areas, many lines of pipes and sewers may be constructed in water-bearing rocks, and deposits below the saturation level. The opening out of a deep trench in porous or permeable material below the saturation level has the effect of draining the measures on both sides of the trench, and producing a lowering of the water levels in the vicinity. This may often give rise to claims for damage to local wells and springs. Any trench excavated below river level, in a valley bottom and in permeable strata, will tend to collect a large volume of water, and similarly where the saturation level rises from the valley bottom more or less parallel to the ground surface, a deep trench, although distant from the river, may require heavy pumping during construction. In all permeable surface deposits and permeable strata, such as chalk, sandstone, sands, and heavily fissured rocks, in which trenches are to be excavated, it may be often worth while to determine the underground water-levels in local wells, in order to see whether it is possible to fix the levels of the permanent work above them. Local wells have not infrequently been drained dry during the construction of a deep sewer, and sometimes permanently, so that it has been necessary to deepen them in order to restore their water supplies.

An interesting example of considerations of this sort occurred during the design of the Burton sewerage scheme. Here it was anticipated that a deep-water sewer would affect the yield of the brewers' local wells. Water levels were measured in these wells and borings were made to determine the geological strata. The water levels, when plotted, showed that the proposed deep sewer would be considerably below the saturation level, and that the trench would intercept the water and carry it down the valley. The original scheme was therefore modified, and the sewer raised above the water table through about half the length at the upper or town end.

In considerations of this kind, hydro-geology has shown that the saturation level is subject to seasonal fluctuations; hence it may happen that a trench excavated in dry ground above the saturation level during one part of the year may be flooded during the winter and early spring seasons when the ground water is high.

Heavy pumping and consequent lowering of the saturation level in certain sands, peat bogs, and marshes, may also seriously affect the foundations of adjacent buildings, producing cracks and settlement. Cases are on record where the saturation level has been lowered several feet by pumping, and accompanied at a distance of 200 ft. by a settlement in the buildings of several inches.

In hilly districts, such as parts of Yorkshire and

South Wales, for example, sewers and lines of pipes may require to be constructed in steep sidelong ground and some slopes. Here there is a strong tendency for the surface material to slip into the trench, and great pressures may be brought to bear upon the timbering, and even upon the permanent work, which may be forced downhill and fracture. Such catastrophes have occurred with lines of earthenware pipes and brick culverts in this country.

In certain types of ground, again, such as those composed of steeply dipping shales or clay masses, surface materials upon a highly inclined rock surface, slips are liable to occur, and even the permanent work may require to be strengthened.

Another curious phenomenon is occasionally noted on deep trenches wholly in clay deposits, which may appear to be perfectly consolidated and firm during excavation. The weight of the material on both sides of the trench may be sufficient to cause the plastic material to flow, with the result that the timbering may be crushed in and collapse, accompanied by an uplift of the bottom of the trench and of the permanent work. The writer has known of a length of over 100 yds. of culvert invert and side walls destroyed in this way. In some of the glacial clay deposits of Lancashire the trench bottoms have been observed to rise between the operations of trimming the trench bottom and bedding the pipes.

In ground of soft clays, mud, silt, running sand or peat, the difficulties of construction are, of course, at their worst. Special precautions must then be taken from the outset in timbering, strengthening the section of the permanent work, draining, and so dealing with the foundations below formation level as to enable the ground to support the weight of the overlying structure.

Finally, we have those subsiding areas in this country due to coal mining or brine pumping, where lines of water main and sewers, and especially the latter, are liable to be constant sources of trouble due to unequal settlement of the permanent work. In most instances of the kind the subsiding areas must necessarily be traversed by these lines of works; but it may sometimes be possible to avoid both the affected areas and those liable to future subsidence. Again, problems of surface protection and purchase of the underground minerals may occasionally arise. The subject is too vast, however, to discuss here, but it may be taken for granted that in questions of this kind the engineer armed with a sound knowledge of the local underground geology and its relation to the subsiding surface is likely to be more efficient not only in dealing with lines of pipes and sewers, but with reservoirs, filters, bacteria beds, and other works.

SITES FOR SEWAGE IRRIGATION FARMS, CEMETERIES, ETC.

In the selection of sites for sewage irrigation areas, the nature of the underlying subsoil is one of the most important factors. Usually extensive stretches of porous or permeable material, such as gravels and sands, prove the most satisfactory land for this purpose. The ground water levels and the direction of underground flow in relation to the nearest stream or river, and the possibility of pollution of local wells and springs should all be investigated. Hence, practical geology and hydro-geology are here both of direct application. Where bacteria beds are in use, and the effluent is comparatively harmless, these conditions, of course, are not so important.

In the location of cemeteries, again, similar investigation is essential. A suitable subsoil, easy to excavate, and capable of standing without support for a short time, is desirable. The maximum height of the ground water should be below the level of the bottom of the graves, and the direction of its flow, where there is any question as to pollution of local wells and springs, should be ascertained, either by actual measurement or by inference from the local geology.

ROADS AND ROAD METALS.

In the construction of new roads in the colonies or other foreign countries, practical geology may be a very important factor in location, where the choice of a route may be guided by the geology of the district to be traversed. Thus, areas liable to slips, or formed of very soft or very hard material, or requiring heavy retaining walls, may sometimes be avoided by deviation. In this country, however, the routes of the few new roads that are now being, or likely to be, constructed, are more or less fixed within rigid limits. Still, even here practical geology and hydro-geology, when combined with engineering experience, are valuable aids in the excavation and drainage both of the cuttings and the road-bed itself.

As regards the materials for road metals, a sound knowledge of the occurrence and petrology of road stones is decidedly useful. The early experimental and scientific work of Lovegrove, Howe and Flett in this country, and others abroad, was a promising beginning in the scientific study of road metals. The introduction of tar and bituminous compounds, the tests of different materials in actual use on the road, as at Sodeny, and the formation of the Road Board marked further stages. But road engineers are still finding difficulty in arriving at standards of value in road materials, and much practical and scientific work seems still to be necessary, both from the engineering and geological aspects. The modern road must necessarily be a complicated study, containing as it does problems in physics, chemistry, and geology. Perhaps with the establishment, in time, of courses in highway engineering at the universities, so strongly urged recently by Mr. H. P. Boulnois, we may stimulate scientific research in this direction, and, in conjunction with the practical results and experiments of road engineers, evolve a new technology, for which there seems to be a considerable need.

DISCUSSION OF DR. LAPWORTH'S PAPER.

Mr. S. S. Platt (Rochdale) proposed a vote of thanks to Dr. Lapworth. As some of them knew, he (the speaker) had taken a great deal of interest in this branch of their work, and had, perhaps, a little longer experience than Dr. Lapworth, and to that extent had realised quite as much as he had the necessity for engineering training to include a considerable knowledge of applied geology. In Vol. 35 of their "Proceedings" there was a very excellent paper by Mr. Julian, and he spoke on it then. This was a more amplified paper, and one of the best papers he had ever come across. It embodied practically all that could be said on the subject. In an address which he gave some years ago he said: "I do not mean to say that he should necessarily be an expert in these kindred subjects, but he should be sufficiently well grounded and acquainted with them as to be able to deal with ordinary developments, to interpret properly and apply the work of specialists in this branch, and to appreciate fully the relation of these subjects to the engineering work he has in hand or in contemplation." If there was one thing more than another, in addition to excavations, it was with regard to the study of stones for road construction. They had the attrition tests, and so on, but the engineer could do a great deal for himself. He could tell very soon whether any stone was likely to suit his purpose. In foundations, tunnels, drainage, and so on, it was necessary that he should know what to expect and what to look for. He did not propose to enlarge upon it, but only to ask the members to read this paper very carefully. It was written in a popular manner, and if they would only saturate themselves with the spirit of it, they would be a good deal wiser; it would lead them further in the study of geology, and they would benefit considerably. He had very great pleasure in moving a hearty vote of thanks to Dr. Lapworth.

Mr. F. C. Uren (Aldershot), in a communication read by the secretary, said the importance of a knowledge of geology could not be over-estimated either to the consulting or municipal engineer. This view was emphasised in the curriculum obtaining in all engineering colleges, both at home and abroad, where geology and mineralogy formed an integral part of the education of the engineering student.

Mr. Platt said that in all his works he insisted upon all his assistants recording information as to the strata passed through in all trenches and excavations, and the information obtained was exceedingly valuable, and would be useful in the future, except in places where the ground changed very rapidly and the changes could not be foreseen.

The Chairman (Mr. T. W. A. Hayward) said that they felt greatly indebted to Prof. Lapworth for writing this paper. He quite agreed with everything Mr. Platt had said with respect to this paper. It was a paper which would be of great service to them hereafter as a work of reference.

Dr. Lapworth thanked those present for the reception of the paper. The paper did not attempt to set out difficulties which arose in work, but tried to show

[illegible]

THE WAR: PRESIDENT'S CIRCULAR TO MEMBERS.

[illegible] Mr. J. S. Pickering, president of the Institution of Municipal and County Engineers, [illegible] circular to the members of the Institution.

"Since the outbreak of the War Office [illegible] assistance which might be given by members of the Institution in [illegible] suggested would be gladly taken advantage of in case of emergency. A grave crisis having arisen, the following [illegible] within the power of our members to render:—

"(1) To be prepared to point out suitable camping grounds and temporary halting-places having regard to water supply and sewage disposal, and for this purpose to co-operate with the water engineer of the district. It is suggested that suitable places should be indicated on a map in readiness.

"(2) To be prepared to improvise water supplies, and to carry out sanitary measures in connection with camps, &c.

"(3) To facilitate transport by having all main roads free from obstacles, and any weak bridges made safe for heavy traffic.

"(4) To be prepared to guard against possible interference with the supply of water, electricity, &c., by spies.

"(5) To be prepared with suitable employment in case of distress, particularly bearing in mind that labour, and not material, should form the chief part of the work.

"(6) To offer services gratuitously to adjoining districts from which a colleague has gone to the front.

"(7) To urge upon employees the duty of acquiring a knowledge of ambulance work, and to give every facility and encouragement to them for so doing.

"No doubt these and other matters in which the local knowledge of members of the institution may possibly be useful to the military authorities have been already considered, but the foregoing suggestions are made with a view to ensuring the ready co-operation of our members."

Exeter City Surveyor and Road Making.—Mr. T. Moulding, the city surveyor of Exeter, has announced that he is about to report to his Streets Committee on the whole question of road making, including tar-spraying.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Canadian Road Enterprise.—Nowhere throughout Canada has the matter of road improvement taken greater hold of any town than at Belleville, in Ontario. Owing to the enterprise of Belleville several past-presidents of its Board of Trade, accompanied by an engineer, have been in England inquiring into the merits of various road-surfacing materials and inspecting roads. This party has been under the guidance of Mr. John Elliott, a well-known resident in Ontario, president of the Board of Trade of Belleville and manager of the Standard Bank of Canada there.

Southgate's Housing Scheme.—Mr. C. G. Lawson, surveyor to the Southgate Urban District Council, explained at an inquiry recently that the proposed housing scheme of the council provided for 160 houses, comprising seventeen to be let at 8s. a week inclusive, eighty-four at 7s., fourteen at 7s. 6d., thirty-one at 5s. 6d., and fourteen tenements (divided into twenty-eight flats) at 4s. a week each. All the houses would be equipped with cupboards, baths, and every up-to-date sanitary and other convenience. The roads on the estate would be 40 ft. wide, the distance between the buildings being 80 ft.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

What can the civilian do, individually or collectively, to assist the country in this the greatest crisis that has occurred since the days of Napoleon?

* * * *

What can the local surveyor do in order to assist the Government and the War Office in the mobilisation and movement of the troops, armaments and stores?

* * * *

What can the local authorities and their officers do, by way of preparation, for the provision of temporary hospitals, medical staff, and nurses if the occasion should unfortunately arise when they are suddenly required?

* * * *

What can be done towards assisting in the necessary protection of our water supplies, machinery, gas-works, and other necessary adjuncts of our daily life?

* * * *

What can be done to make provision to stem any outbreak of enteric or other diseases which seem inseparable from war?

* * * *

What can be done to prevent, so far as is possible, any waste of food, petrol, or other commodities which may, at no far-off date, become scarce?

* * * *

What can be done to assist in the provision for billeting the troops of our country if and when the necessity arises?

* * * *

What can be done to keep as many men as possible employed on municipal works, so as not to swell the ranks of the unemployed?

* * * *

What can be done to prepare for the danger of conflagrations on a large scale? Could not the fire brigades be temporarily strengthened by volunteers, who should be at once trained in their duties?

* * * *

Cannot these suggestions, and many more, be well considered and put in practice at the present moment, so that we should not be altogether unprepared in the case of any eventuality occurring?

* * * *

Will not all road makers be glad to learn that Mr. Herbert Samuel has promised a committee to investigate the present regulations of the Local Government Board with regard to weights of vehicles, widths of tyres, and similar matters? Are there not many other questions, such as speed limits, damage caused by motor omnibuses, grants in aid, which could be usefully investigated by such a committee?

* * * *

Do many of us realise the almost staggering figures that can be deduced, by a little calculation, of the cost of four roads, on reading the fourth annual report of the Road Board? Do we not find that the cost of the "improvement of the crusts" of about 368 miles of county main roads has been about £690,000? Do we not also find that there are 27,879 miles of county main roads in England and Wales, and that, consequently, to treat only one half of these roads in a similar manner would cost about 26 millions of money? Does the "man in the street" realise this when he talks so glibly of "the bad state of our roads"?

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

MERSEY AND IRWELL JOINT COMMITTEE.

CHIEF INSPECTOR'S REPORT.

Mr. Hugh Stowell, M.INST.C.E., chief inspector to the Mersey and Irwell Joint Committee, has issued a report dealing with the work of that authority during the past two years.

Continuing his slow progress has been made as regards progress towards efficiency of sewage works belonging to county boroughs in the area within the jurisdiction of the committee. Bolton have not yet been able to commence their large extensions owing to the renewal of coal working under the site of the works. At Manchester a new scheme of extensions has been approved for the Davyhulme works, and good progress has been made with the new main sewerage scheme. Under this scheme the sewage of the inefficient Moss Side sewage works has already been diverted to Davyhulme, a portion of the Gorton sewage has already been, and the remainder should shortly be diverted to Davyhulme. At the Withington sewage works of the Manchester Corporation a tank on the Imhoff system—believed to be the first installation of its kind in the country—has been constructed, and will shortly be in operation.* At Oldham the remainder of the percolating filters have been completed and are in operation. At Rochdale the first instalment of the large extension has been completed and is in operation. The second instalment of additional percolating filters, in accordance with an undertaking given to the Local Government Board, should be commenced by May, 1915. The Salford Corporation have given an undertaking to complete all the works recommended by their consulting engineer, except the additional area of filters, by September, 1915, and the additional filters by September, 1916. At present only the renewal of the existing filters is in progress. Stockport have had a large scheme of extensions approved by the Local Government Board, but it is at present in abeyance pending negotiations with Manchester for the interception and treatment of the Stockport sewage. The urban district of Heaton Norris has been amalgamated with Stockport, and the sewage will be taken to the Stockport sewage works.

Among the non-county boroughs, Ashton-under-Lyne have submitted a scheme of extension to the Local Government Board, Macclesfield have extensions under consideration, and Middleton have entered into an agreement with the Manchester Corporation for the reception of their sewage into the city sewers for treatment at the Davyhulme sewage works. The large extensions at the sewage works of the Leigh and Atherton Joint Sewerage Board have been completed, and are in operation. Very slow progress has been made with the extensions at the sewage works of the Stalybridge and Dukinfield Joint Sewerage Board, but new arrangements are being made which will, it is hoped, expedite completion.

Among urban districts, schemes are under consideration for Altrincham and Irlam. A new sewage works has been completed, and is in operation, for the Heatley district of Lymm. The extensions at Crompton (New Hey), Swinton and Whitefield have been completed. Extensions are in progress at Denton, Ramsbottom, and at the works of the Urmston and Flixton Joint Drainage Committee. Good progress is being made with the new sewers and sewage disposal works for the Springhead Urban District, and also with those of the Whaley Bridge and District Joint Sewerage Board. Schemes for extension have been approved by the Local Government Board at Tottington and Tyldesley, and will shortly be commenced. Schemes have been submitted to the Local Government Board for extensions to the sewage works at Hale, Turton (Eagley), and Westhoughton (Rogers' Farm). Extensions to the filters have been constructed at Kearsley, Littleborough, Little Hulton (Ellenbrook), and Radcliffe.

At several other works minor extensions have been carried out.

Among the rural districts, new sewage works have been completed for Outwood and Ringley, in the Bury Rural District, and at Tintwistle. Schemes have been submitted to the Local Government Board for extensions at Coppice Clough (Barton Rural District), Northenden (Bucklow Rural District), Prestolee (Bury Rural District) and Disley.

During 1912-13, 5,694 inspections have been made at sewage works and 952 samples taken, of which 381 were classed as bad or as polluting character, and 571 were passed. "Progress towards efficient purification should not be judged by these figures." Mr. Stowell points out "a great number of samples are always taken from works which are known to be inefficient; for instance, of the 381 samples condemned, over one-third came from three sewage works belonging to county boroughs."

No radical alteration in methods of sewage purification has been adopted in the last two years, but a considerable amount of investigation has been devoted to methods of sludge disposal with a view either to a reduction of bulk and offensiveness, or to the recovery and utilisation of manurial constituents. "The sludge problem has often," Mr. Stowell observes, "been described as the crux of the question of sewage disposal and this problem tends to increase rather than decrease in importance with modern methods of sewage disposal, as the higher efficiency aimed at has resulted in an increased bulk of sludge to be dealt with." The provision of storm tanks and humus tanks has been amply justified by the amounts of sludge retained. At one sewage works, with a dry-weather flow of 1,500,000 gallons, in two months 1,150 tons of wet sludge were taken from the storm tanks, resulting in 311 tons of pressed cake. The storm sludge mixed with ordinary sludge pressed well, requiring only 5·44 per cent of lime against 7·25 per cent required for ordinary sludge. No extra time was necessary to press this extra quantity, and it is stated that no extra cost was involved.

"In a previous report," Mr. Stowell recalls, "I referred to the necessity for the provision of gauging appliances at sewage works to enable accurate information to be obtained of the amount of sewage dealt with, and for the proper separation of sewage proper and storm flow. Without such information, satisfactory control of the works and the accurate fixing of the levels of overflow sills is difficult, and controversy is often raised over the relative proportions dealt with as sewage and storm water. In a few cases such appliances have been provided, but their more general adoption is very desirable, and it would be of great assistance if the Local Government Board insisted on their provision before sanctioning sewage disposal schemes of any considerable size."

* An illustrated description of this appeared in THE SURVEYOR of May 29th last.

SANITATION AND WAR.

On Tuesday afternoon last about eighty officers and men of the 2nd London Sanitary Corps, under the command of Major Goddard, visited the Royal Sanitary Institute in Buckingham Palace-road. They were welcomed, on behalf of the council of the institute, by Mr. H. Percy Boulnois, M.INST.C.E., vice-chairman of the council, who, after speaking of the patriotic work in which the corps were engaged, proceeded to give a short lecture on sanitary subjects, illustrated by lantern slides.

On the conclusion of this lecture, Mr. W. C. Tyndale, M.INST.C.E., the sanitary adviser of the War Office, gave an address of an interesting and practical character on the sanitary requirements of the barrack and the camp.

Subsequently the men proceeded to inspect the sanitary appliances and other exhibits in the Parkes Museum, which forms part of the Royal Sanitary Institute premises, the various objects being explained by members of the council who were present.

The example of the Royal Sanitary Institute is one which might well be followed by other institutions or societies while the men are waiting for active service.

Coast Sand Dunes, Sand Spits and Sand Wastes (By G. O. Case. St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 5s. nett.).—The object of this book, as stated by the author in the preface, is to direct attention to the advantage of controlling the blown sand dunes on the sea-coast so as to make them act as a protection to the land behind from erosion by the sea, to prevent them from advancing inland and destroying existing vegetation, and to enable sand wastes, where they exist, to be reclaimed and planted with trees. . . . The information on the subject dealt with is, however, given in a handy form, and will be found useful and instructive to those interested in coast geology or having charge of land bordering on the sea shore.—*Nature.*

Law Notes.

Edited by E. REGINIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

In future will be passed to answer any questions affecting the profession of engineers and surveyors to municipal authorities. Queries should be written legibly on one side of paper, and be addressed to "Law Notes," The Surveyor, at the office of the Surveyor, and signed by the writer's name and address, but correspondents may do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction, i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

QUERIES AND REPLIES.

In order to avoid confusion queries are requested to use distinctive nomes de plume. The letter X. contributes as "X Y Z," and local clerks as "engineer" and "surveyor," respectively.

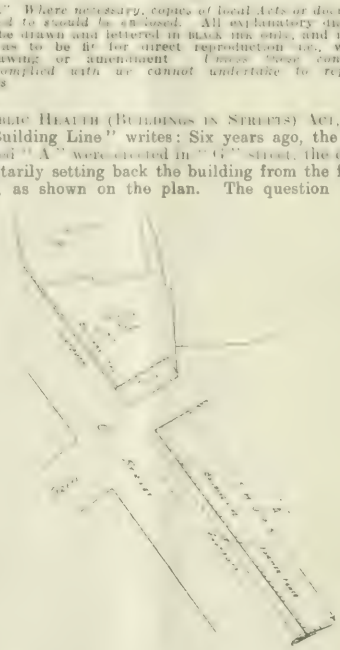
[illegible] Accident Compensation. [illegible] A. writes: What is the position of an official who is a local authority who moves with an accident while engaged in the performance of his duties, and in a large extent, disparagates him for [illegible] local authority does not engage anyone to do his work, and who, by the assistance of members of his family, arranges to keep the duties going [illegible] to the contrary. The official duties performed at the time of the accident was emergency [illegible] of ordinary office hours. The accident happened at 9.15 p.m. The local authority [illegible] injured officials [illegible] the Workmen's Compensation Act, [illegible] the insurance company in respect of the accident. The [illegible] has not practically recovered, but he has a large scar on the face as the result of the injury, which will be a permanent disfigurement to him. (1) On what basis should compensation be settled? (2) Is the injured person entitled to compensation for the permanent facial disfigurement apart from the incapacity from duty? (3) On settlement of the amount with the insurance company, are the local authority entitled to hold the money, as they have paid full salary during incapacity, although they have not relieved the official from any of his duties, nor paid anything [illegible] to have the work of his office carried out?

(1) Assuming that the [illegible] is a workman within the meaning of the Workmen's Compensation Act, 1906, and that the accident arose out of and in the course of the employment, and that taken at period incapacity for work [illegible] from the injury, he would be entitled to a weekly payment during the incapacity not exceeding 50 per cent. of his average weekly earnings during the previous twelve months [illegible] his employment, such weekly payment [illegible] but if the incapacity lasted less than [illegible] weeks, no compensation would be payable in respect of the first week. (2) No. (3) Assuming that the insurance policy is in the usual form, the company are only liable to pay to the local authority the amount which the latter are liable to pay the official. The local authority are entitled to retain the amount received from the company.

Private Street Works. Public Footpath. "Chase" writes: A road [illegible] is proposed to be made up a private street, being a continuation of a main road [illegible] with urban powers under the Private Street Works Act, 1892, for the purpose. It [illegible] that a portion [illegible] throughout its whole length as representing the public footway. If the council do this, can they treat the two [illegible] separate and distinct streets under the Act, and apportion [illegible] to the frontagers respectively? In other words, would dealing with the matter in this way circumvent any [illegible] ment?

In my opinion the council can treat the strips on each side of the old footpath as separate streets, and charge the frontagers on the respective sides with the expenses of making them up. I assume that there is no controversy as to the actual position and boundaries of the old footpath.

Public Health (Buildings in Streets) Act, 1888.—"Building Line" writes: Six years ago, the shops marked "A" were erected in "G" street, the owners voluntarily setting back the building from the former fence, as shown on the plan. The question of the



building line now arises as to plot marked "B" (formerly used as a school), and "C," the school yard. If new buildings were erected on these plots fronting "G" street, would you consider the proper building line the present boundary wall, or should they be set back in line with the shops?

In my opinion any new buildings erected on plots B and C must be set back to the building line of the shops.

Selling and Widening Private Street. "Inkstand" writes: A bought a plot of land and built two villas. B and C bought other plots, and commenced to build rows of houses. The local authority laid the sewer along the street B's houses in the centre of a 12-ft. street. (1) Can the local authority compel A to pay half the apportionment of this 12-ft. street under the Private Street Works Act, 1892, seeing he did not [illegible] of the land for the 12-ft. street, B and C giving it all? (2) Can the local authority, at any future time, compel A to give 12 ft. to the existing 12 ft., and thus form a 24-ft. street now or when the land is opened, and the road continued through [illegible]?

(1) Assuming that the street is not a highway repairable by the inhabitants at large, A would be chargeable as a frontager with an apportioned part of the expenses of private street works thereto under the Act of 1892. (2) If A, by building more houses or otherwise, lays the street out as a new street, he would have to conform to the provisions of the by-laws as to the width of new streets.

Rainwater Pipes. "Essex" writes: It is the practice in this borough to compel owners of property who have rainwater pipes discharging in the front of their premises to connect them to an iron rainwater conductor (with opening in the top) fixed across the public footpath and discharging into the road channel. These conductors get choked with dust and mud, and the question has arisen as to who is liable for cleaning same out. Is the owner or corporation liable?

Under sec. 74 of the Towns Improvement Clauses Act, 1847, *occupiers* can be compelled to put up and keep in good condition a shoot to carry water from the roof in such manner that it shall not fall on persons passing along the street or flow over the footpath. The occupier can also be compelled to connect the down pipe by a channel or pipe under the footpath into the surface-water channel by the side of the street (Copnall's "Law Relating to Highways," second edition, p. 371). Presumably this means that the connecting channel or pipe is to be constructed at the occupier's expense, and I think it follows that it is his duty to keep it cleansed and in working order, so as to prevent his water from flowing over the footpath.

Royal Sanitary Institute Congress at Blackpool.

(*Conclusion.*)

[illegible] the papers [illegible] Association Section of the recent annual congress of the Royal Sanitary Institute at Blackpool was the [illegible] applied to towns. A number of others [illegible] up to the [illegible] which have [illegible] space with [illegible] in future issues.

TOWN PLANNING AND INDUSTRIAL TOWNS

By F. W. Platt.

[illegible]

[illegible] town planning be most [illegible] applied. A brief classification of towns might be made under the following heads: (1) Towns of old standing, partly industrial. (2) Largest towns, industrial and commercial. (3) Municipal and county boroughs, more industrial than commercial. (4) Municipal boroughs and urban districts, entirely industrial.

In the first three in this list the problems to be solved are more similar in character than in the fourth. The fourth class is probably an example of a modern industrial town. Doubtless it had developed in a sporadic way. Originally it was a group of villages dotted upon the country side, all connected with one another by roads more or less narrow. The inhabitants depended for their existence upon their skill in a particular industry. As the industry increased in volume buildings were erected alongside the roads connecting the various villages. No ordered plan of development was prepared. A community of interest however existed, which, actuated with motives of self-preservation, made application for a charter of incorporation, and thus a town was formed. . . . .

Yet such towns present better opportunities of improving their conditions at less financial cost than do the larger towns. Their geographical position in relation to the undeveloped areas is an advantage in the future planning of the town, and it is rare to find in a town formed as here described that the density of population is great over a considerable portion of its area.

Let it be remembered that a town planning scheme may be made in respect of: (1) Land in course of development, or likely to be used for building purposes; (2) land so situated, in respect of land likely to be used for building purposes, &c., that it ought to be included in a town planning scheme made in respect of such before-mentioned land—*i.e.*, land already built upon, but adjoining vacant land; (3) land upon which it is necessary to carry out works to complete a scheme made in respect of lands of which items 1 and 2 form parts, and that the general objects of town planning schemes are to provide proper sanitary conditions, amenity, and convenience in the laying out of lands.

Before any town planning scheme may become operative it must receive the approval of the Local Government Board. The first step towards obtaining this is to prepare a *primâ facie* case that a need to town plan exists. Thus the scheme has its origin, and its details must be prepared with due regard to the principles set out above.

A large scale map of the district as now existing should first be examined and afterwards compared with old maps. The sequence of the growth of the town can be followed by these means, and the situation of the vacant land disclosed. An opinion based upon the foregoing examination should be formed whether such land is "land," &c., within the meaning of Conditions 1, 2 or 3 above. When forming this opinion it is important to note that it is the situation and not the size of each plot which is the governing feature. An acquaintance with sec. 54 (7), Housing and Town Planning Act, will also be of much assistance at this stage. Should it be found that the bulk comes under Condition 1—namely, "land in course of development," &c.—it ought not to be difficult to prove that the land adjoining it should be dealt with under Condition 2. Condition 3 is a necessary complement of the preceding conditions.

All that remains, then, is to show that the "general objects" of a town planning scheme are fulfilled, and (subject to certain procedure rules being followed) the *primâ facie* case is made. In the meantime some of the land and buildings may have been dealt with under Part I. of the Housing and Town Planning Act, 1909; for example, closing and demolition orders may have been issued.

The prospective as well as the immediate value of a town planning scheme becomes more apparent during the actual preparation of the town plan. Ideals are translated into fact and find expression in the joining up of the various parts of the district with a chain of roads. By these means light, air, and the prevailing winds are admitted into the more densely developed areas, through which the links pass. The plan should also make provision for the redevelopment of those areas already cleared or closed under demolition orders.

The making of the roads through these areas would cause an increase in value to arise in the land adjoining such roads; and the improved traffic facilities to the land would render it more suitable for industrial or commercial purposes. One-half of the value attributable to these causes would be claimed by the local authority, and applied by them to meet the cost of demolition in other places. . . .

Small industrial towns do not, as a rule, possess many open spaces in their centres. Instances are frequent where circumstances such as contours have rendered it essential for a larger number of houses or other buildings to be erected upon a given area of land than is now thought desirable. Where such exist the provision of an open space in close proximity to a crowded area has a balancing influence. The principle of betterment, recognised by the Act, could then be applied to the adjoining buildings, and the property being improved, the district would be healthier and another amenity added to the town. . . .

The problem of the industrial town does not end when the dense areas have been opened out by arterial roads. The standard of limitation of the number of houses to the acre must receive attention. A minimum "population density" is of the essence of this subject. . . . The actual number of houses depends upon situation and the connection of the area with other dwellings. Fifteen has been considered a reasonable maximum for industrial centres, and whether the "land unit" to which it applies be one or more acres, provision should be made that under no circumstances would it be possible to crowd a large proportion of the houses on one part of the unit, and leave the remaining land open for other prospective use.

The economic aspect of town planning requires but little comment. Every local authority has experience of the cost of street widenings. It is also spending annually enormous sums in sanitary administration to combat the effects of bad housing in industrial centres. Less ascertainable, but none the less real, is the loss to the nation from sickness, ill-health, and premature death.

Mr. J. S. Brown (Blackpool) said that Mr. Platt seemed to think that a good deal could be done in the way of town planning under the by-laws, but most of them would be familiar with the fact that many of them were driven to go to Parliament with private Bills because the Local Government Board were so very timid in granting the local authorities any strong by-laws. The Local Government Board were very timid of going beyond the general law. He hoped that the board, through the Departmental Committee, would proceed to show a little more backbone in regard to entrusting local authorities with stronger by-laws in respect of building operations.

Mr. G. W. Lacey (Oswestry) pointed out that there were many small towns where the growth was comparatively small, and where the preparation of a town planning scheme was almost entirely out of the question.

Mr. C. J. Jenkin (Finchley) said his local authority went to the Local Government Board for by-laws for their No. 1 scheme, and said they wanted certain waiving and modifications of by-laws, and they were told by the Local Government Board that they did not think those by-laws should be special for any one town planned area. They were told that if they altered their by-laws at all they should apply to the whole of the district because otherwise they would be

[illegible]

[illegible] done.

Mr. E. Wilkins (Cork) [illegible] the rural districts that they could carry out what they wanted at practically no cost. The building line, in [illegible] which could be obtained under the Town Planning [illegible] local owners could fix the building lines in all future [illegible]

Mr. Munce (Belfast) asked why the council of the institute did not appoint a small committee to draw up model by-laws. With regard to the width of the streets in Belfast, they had taken the original routes [illegible] were doing this widening bit by bit. They did not ask the Local Government Board, but when a man wanted to make an alteration to his property they made him conform to their line.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.

—Massinger: "The Fatal Dowry," Act ii., 2.

REMOVAL OF IRON FROM WATER.

To the Editor of The Surveyor.

Sir,—Your article on p. 150 of The Surveyor of July 31st on "The Removal of Iron from Water" without the use of chemicals has interested me very [illegible]

Your readers may like to know that for many years past a large number of installations have been laid down in this country for removing iron from public and private water supplies by direct oxidation in special Candy filters without employing chemicals. In the Candy compound mechanical filter the difficulties you mention as having been experienced with the American filters are entirely overcome.

You [illegible] that after six weeks use the sand grains in the [illegible] so badly coated (with the iron) that the ordinary washing arrangements, including compressed air, were found to be inadequate, with the result that the sand had to be taken out of the filter, washed by being pumped through a centrifugal pump, and then replaced.

The [illegible] water from a fire hose for stirring and washing the sand in the beds has, your article states, been found to be effective, and you express the opinion that "it is remarkable that, for such a purpose as this, the fixed spray or rotary sprinkler, similar to those used for sewage filters, is not applied more frequently."

It is, we think, an interesting fact that the method of cleansing the sand in the Candy mechanical filter combines both the fire hose and the rotary sprinkler principle, the sand being cleaned by a continuous row of powerful jets of water issuing, under pressure, from an arm which, during washing, is rotated just above the level of the sand. The jets of water, which are discharged at a velocity of from 40 ft. to 50 ft. per second, penetrate the whole depth of the loosened sand, dashing and rubbing the grains violently one against the other. The water from the jets then combines with the usual upward flow that takes place at the same time, and the united water rises up through the sand, rapidly carrying away the suspended matter—iron or other impurities—that have been freed by the intensive scouring action produced.

I think you will agree that the Candy cleansing system is an ideal one, and far in advance of the American method referred to, and I trust that you will be kind enough to give it, in your columns, the same publicity that [illegible] the American system. We find that we have nothing to learn in the way of mechanical filtration from America, and contend that the mechanical filters manufactured in this country are in many ways in advance of the American practice.

We would like to mention that we have recently supplied installations of the special Candy non-[illegible] filters to the Cromer Council and the [illegible] Water Board, and are just completing an installation for the Staffordshire Potteries Waterworks Company. Yours, &c.,

Frank Candy,
Managing Director,
Candy Filter Company, Limited.

5 Westminster Palace-gardens, S.W.
August 12, 1914.

THE WAR.

To the Editor of The Surveyor.

Sir,—I trust that, during this crisis through which our beloved country is passing, your columns will be kept open for anyone who has anything useful or practical to suggest, so that we who are forced, from various causes, to remain spectators may each add our mite to assist, or at all events not to retard, the great issues at stake. May I therefore give you a few sugestions as to what I consider to be the citizen's duty in time of war?

(1) Whatever his politics may be, he should be loyal to the party in power if they are patriotic.

(2) He should keep calm; there is nothing to be gained from panic, nor, on the other hand, by shouting "Rule Britannia," which should be reserved for the time of victory.

(3) He should scrupulously prevent all waste of food, and should not selfishly store large quantities of provisions. If there is a limited supply of food, he should remember that every article withdrawn from the general supply leaves less for others.

(4) He should ascertain if there is anything he can give or lend to the Government in order to assist his country.

(5) If the necessity arises, he should at once be sworn in as a special constable.

(6) He should remember that it is each unit that makes a mass, and that every individual citizen can do something to strengthen that mass.

(7) Beyond all he should practise unselfishness. Yours, &c.,

H. P. B.

August 8, 1914.

To the Editor of The Surveyor.

Sir,—Every patriotic citizen who is too old to join the Forces, or is unable to do so for various good reasons, is asking what can I do to assist my country in this great crisis?

It appears to me that there are several ways in which each one of us can do something, if not heroic at all events useful.

(1) We can more scrupulously obey the law so as to cause as little trouble as possible to the police.

(2) We can each one of us be a little more unselfish, and help each other in every possible manner. We can pocket our selfish grievances for a time, and suspend all unnecessary quarrels.

(3) Even litigants can suspend hostilities, and give opportunities for those who would be preparing their selfish quarrels to attend to their more patriotic duties.

(4) We can set an example of temperance. It is the one blot on our boasted patriotism that our public houses should be daily and nightly filled to overflowing with the so-called working classes who are spending their money freely in drink—money which may, ere long, be urgently wanted to prevent them and their families from starving.

Cannot we each one induce these men to realise that money thus wasted in drink is helping the enemy?—Yours, &c.,

Civilian.

August 11, 1914.

To the Editor of The Surveyor.

Sir,—It is a rather curious coincidence, and may be of interest to your readers to hear that on the page of my diary for Wednesday, August 5th, the day that war was declared, the following quotation from Southey appears:—

Order is the sanity of the mind, the health of the body, the peace of the city, the security of the State.

Can we not all take this lesson to heart at the present moment and by so "ordering" our minds

The Surveyor

and Municipal and County Engineer.

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become useful to the State, and add to its "security"? Yours, &c.,

M.INST.C.E.

August 11, 1914.

To the Editor of THE SURVEYOR.

SIR, "H. P. B." raises, in your last issue, considerations of the very first importance. Undoubtedly the municipal engineer can render national service in the directions your correspondent indicates, and I would suggest that the Institution of Municipal and County Engineers at once get into touch with the military authorities, and in conference settle the lines upon which municipal, civil and military engineers should co-operate. Yours, &c.,

BOGNORIAN.

August 12, 1914.

To the Editor of THE SURVEYOR.

SIR, I have read with interest the letter from "H. P. B." which appeared in your last issue, and I beg to inform you that the matter he treats of has for some considerable time been under the consideration of the Institution of Municipal Engineers, and that representations upon it have already been made to the Secretary of the War Office. Yours, &c.,

B. WYAND,
Secretary.

39 Victoria-street, S.W.

COLE TESTIMONIAL FUND.

To the Editor of THE SURVEYOR.

SIR, Owing to an unfortunate clerical omission of a paragraph from the circular letter, the appeal in connection with the above gave an impression that contributions were to be limited to 1s., whereas (as explained in a subsequent circular) the intention was to ask for contributions of 1s. to 5s. It was anticipated that the bulk of the members would prefer to subscribe 5s. each, but the lower figure was suggested in order to give every member an opportunity of contributing something, however small in amount. May I ask members who have not already subscribed kindly to do so as soon as possible, and those who have forwarded 1s. under the impression that this was the limit suggested to supplement it by a further contribution should they so desire? If an acknowledgment is required, a stamped addressed envelope should be enclosed with the subscription. I earnestly hope that every member of the institution will show his appreciation of the long and faithful service of our late secretary by sending a contribution to the fund. Yours, &c.,

T. S. TICKELING,
President, Institution of Municipal and County Engineers.

Municipal Offices,
Cheltenham.
August 6, 1914.

GOVERNMENT WORK.

NO SUSPENSION OF OPERATIONS.

(OFFICIAL.)

It appears from various inquiries addressed to the Commissioners of Works that there exists some apprehension lest unemployment should be increased in the building and other trades by suspension during the present crisis of building and engineering operations provided for in the estimates of the Office of Works recently approved by Parliament. It is therefore desirable to state publicly at once that it is the intention of the Commissioners of Works to proceed with all services in their charge, to employ as many men as possible to carry out such services, and to develop and expedite their building programme in any way practicable.

As the Minister mainly responsible for Government building, the First Commissioner of Works would wish to take this opportunity of expressing his sincere hope that private individuals, companies, firms, and contractors will spare no effort to follow the policy of the Government in this matter, so far as circumstances admit.

RECLAMATION AND AFFORESTATION.

The Development Commissioners desire to suggest to landowners in England and Wales that they should at once forward to the Agricultural College for their province particulars of any waste land which they are willing to place at the disposal of suitable authorities for improvement by such means as reclamation or afforestation. The particulars of the land should include situation, approximate area, elevation, character of the soil, and the terms on which the land can be obtained by an authority willing to improve it.

LABOUR EXCHANGES AND HARVEST.

The Board of Trade Central Office for Labour Exchanges are making special arrangements for the supply of the farm hands and others required in connection with the harvesting season. All farmers and other employers who are desirous of engaging this class of labour should communicate their wants to the manager of the nearest Labour Exchange, the address of which can be obtained from the local post office. It should be remembered that no fees are charged, either to employers or employees.

Royal Sanitary Institute: Meeting Postponed.—The projected meeting of the Royal Sanitary Institute at Shrewsbury on October 9th and 10th has, we understand, been indefinitely postponed.

Sheffield Hospital Extensions.—The Local Government Board have sanctioned the borrowing of £65,000 required for the proposed extension of the Lodge Moor Hospitals, Sheffield, for infectious diseases. The work is to be commenced at once.

Roadman's Compensation Claim.—The case of a road sweeper who sued the Twickenham Urban District Council for compensation in respect of an accident while in their employment was decided by the Brentford County Court judge last week. The applicant was injured while road sweeping by being run into by a motor car. The district council made him allowances, and then the owner of the car paid him £40 as damages, out of which he refunded the council what it had paid him. The respondents contended that by accepting the damages he had put himself outside the Compensation Act, which laid down that an injured person could not have both compensation and damages. To this the applicant's answer was that the council knew of the accident and paid him compensation before he was even offered damages, and that bound the council to pay full compensation. The Judge found for the respondents, and gave judgment accordingly, with costs.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to the Editor, St. Bride's House, 21 Bridelane, Fleet-street, E.C. [illegible] marked "Assistants' Section" on the [illegible] Assistants desiring to [illegible] to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

[illegible] students are invited to the following [illegible]

415. Sewerage. What conditions generally determine the adoption of either the "separate" or the "combined" system of sewerage in a town? (A. ta.)

416. Concrete Floor. Give two sections of a reinforced concrete floor on a span of 30 ft., showing the sizes and weights of the girders, and giving the necessary calculations. (K. G. F., *Buckfastleigh.*)

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. (Ving.)

418. Iron Curved Roof. Show details of an iron curved roof of 40-ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G., *Buckfastleigh.*)

419. Practical Mathematics.—Explain a graphical method for solving simple simultaneous equations, and give a worked example.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

414. Strength of Materials.—Prove the formulæ $\frac{M}{I} = \frac{f}{y}$ and $\frac{M}{EI} = \frac{1}{r}$ with respect to beams, and explain the meaning of the symbols used.

(a) Prove $\frac{M}{I} = \frac{f}{y}$.

M represents the bending moment—that is, the algebraic sum of the moments of all the external

Fig. 1.

loads and reaction acting on one side of a cross-section of a beam.

I represents the "moment of inertia" of a beam,

Fig. 2.

the meaning of which will be clearer if we try to arrive at its value for a simple rectangular beam.

Let ABCD in Fig. 1 represent a cross-section of a beam.

Under the action of a load the beam will deflect [illegible] exaggerated shown in Fig. 2. From this it is plain that the upper fibres (AB in Fig. 1) will be in compression, and the lower fibres (CD, Fig. 1) in tension; also that midway between these opposite kinds of stresses there must be a layer of fibres where the stress is zero. The dotted line marks the position of this layer on the cross-section, Fig. 1, and it is known as the neutral axis.

It follows from the above that the stress at any point will be proportionate to the distance of the point from the neutral axis.

Let p = stress per square inch at 1 in. from neutral axis and let f_x = " " x in. "

$$\text{then by proportion } \frac{1 \text{ in.}}{x \text{ in.}} = \frac{p}{f_x}$$

$$\therefore f_x = px$$

If d is the depth of the beam, when $x = \frac{d}{2}$ the stress becomes $p\frac{d}{2}$, and this is the maximum stress on the extreme fibres.

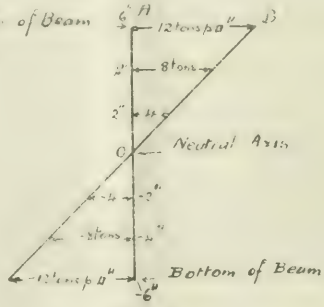

Fig. 3.

Let us take a beam 12 in. deep, and let p (the assumed stress per square inch at a distance of 1 in. from the neutral axis) be 2 tons. Draw a vertical line (Fig. 3) to represent the depth of the beam, and against it draw horizontal lines to represent the intensity of stress at various distances.

Using the equation $f_x = px$ we have:—

Values of x	6"	4	2	0	-2"	-4"	-6
Values of f_x	12	8	4	0	-4	-8	-12

The negative values of x indicate that the points are below the neutral axis, in that portion of the beam which is in tension—*i.e.*, if $+f_x$ indicates compression, then $-f_x$ indicates tension.

Consider the upper half of the beam. From inspection of the figure it will be seen that the mean stress will be half the maximum—that is

$$\frac{p}{2} \text{ or } \frac{pd}{2} \div \frac{pd}{4}$$

The total stress on one half of the beam = mean stress × half the area of the cross-section,

$$= \frac{pd}{4} \times \frac{bd}{2} = \frac{bd^2}{8} p \text{ (where } b = \text{breadth)}$$

Now, the resultant of the varying stresses between the neutral axis and the extreme fibres will act at the centroid of the triangle OAB—*i.e.*, at a distance of $\frac{2}{3} \cdot \frac{d}{2} = \frac{d}{3}$ from the neutral axis, and the moment of the total stress on the half beam will be—

$$\frac{bd^2}{8} p \cdot \frac{d}{3} = \frac{bd^3}{24} p$$

For the whole section, therefore, the moment of resistance will be

$$\frac{bd^3}{24}f = 2 \times \frac{bd^3}{12}p$$

It will be seen that $\frac{bd^3}{12}$ is dependent only on the geometrical properties of the dimensions of the beam section, and is therefore a constant for any given size of beam. This constant is known as the "moment of inertia," and is represented by the abbreviation I.

Now we have the moment of resistance $\frac{bd^3}{12}p$, where p is the intensity of stress 1 in. from the neutral axis.

But what is more important is the stress on the extreme fibres where it is a maximum.

Let f = the maximum stress,

and let y = distance of extreme fibres from neutral axis,

then by proportion

$$\frac{p}{y} = \frac{1 \text{ in.}}{y \text{ in.}}$$

$$p = \frac{f}{y}$$

Therefore, moment of resistance—

$$MR = \frac{bd^3}{12} \cdot \frac{f}{y} = I\frac{f}{y}$$

To preserve equilibrium the moment of resistance must equal the bending moment:—

$$\therefore M = MR$$

$$= I\frac{f}{y}$$

$$\text{Or } \frac{M}{I} = \frac{f}{y} \qquad \text{Q.E.D.}$$

(*b*) Prove $\frac{M}{EI} = \frac{1}{r}$

M, as before, is the bending moment.

A consideration of E will involve also consideration of the meaning of stress, strain, and elastic limit.

Stress is the amount of force, per unit of area, to which a piece of material is subjected; thus, if a force of 24 tons acts on an area of 12 square inches, the stress is 2 tons per square inch. The material will be either stretched or compressed (according to the nature of the force), and the ratio which this change of dimension—say, length—bears to the original length is called the strain.

Up to a certain amount of load this stretch or compression will disappear on the removal of the load; but if the load is increased beyond this amount, the test-piece will be permanently deformed. The point at which this change occurs is known as the elastic limit of the material.

Now, within and up to the elastic limit both stress and strain are proportional to the load producing them, and therefore proportional to one another for the same material, so that, if the stress be divided by the strain, a constant number is produced. The ratio $\frac{\text{stress}}{\text{strain}}$ is called "modulus of elasticity." The particular modulus that refers to a bar under tension or compression is called "Young's modulus of elasticity," and is denoted by "E."

To calculate E we have the relations:—

Let W = load,

A = sectional area of bar in square inches,

L = original length of bar in inches,

e = change of length in inches produced by W,

$$\text{then stress} = \frac{W}{A}$$

$$\text{strain} = \frac{e}{L}$$

$$E = \frac{\text{stress}}{\text{strain}} = \frac{W}{A} \div \frac{e}{L}$$

$$= \frac{WL}{Ae}$$

Let Fig. 4 represent a small portion of a beam, showing an exaggerated curvature produced by bending stresses, and let AB and CD be two cross-sections close together, which before bending were parallel, but which now are inclined and radiating to a centre O. EF is the position of neutral surface. This remains unaltered in length. Let its length be L. Let r be the radius of curvature of the neutral surface. Draw GH through F parallel to AB. Take

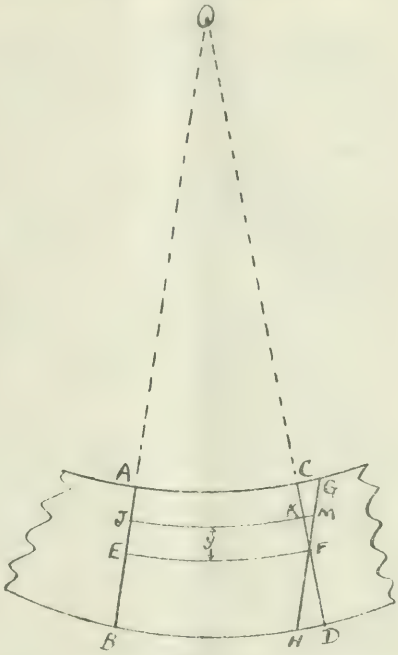

FIG. 4.

any layer, JK at a distance y from neutral surface. It will be seen that this layer has altered in length from EF, or from JM to JK.

Call this alteration in length (KM) e.

$$\text{the strain} = \frac{e}{L}$$

Then, if f is the stress producing this strain,

$$f = E.\frac{e}{L} \quad \left[E = \frac{\text{stress}}{\text{strain}} \therefore \text{stress} = E \times \text{strain} \right]$$

$$\text{also } \frac{e}{y} = \frac{L}{r} \text{ (by similar triangles)}$$

$$\text{from which } e = \frac{L \cdot y}{r}$$

substituting this value of e

$$f = \frac{E}{r}y$$

but as was previously shown

$$\frac{M}{I} = \frac{f}{y}$$

$$\text{or } f = \frac{M}{I}y$$

$$\therefore \frac{M}{I}y = \frac{E}{r}y$$

$$\frac{M}{I} = \frac{E}{r}$$

$$\text{or } \frac{M}{EI} = \frac{1}{r} \qquad \text{Q.E.D.}$$

(H. G. L., *Deptford Times.*)

Brighton Water Undertaking.—The nett profit of the Brighton Corporation water undertaking last year was between £2,000 and £3,000.

Douglas Municipality's New Estate.—The Douglas Town Council have purchased the Pulrose estate, near Douglas, consisting of over 200 acres of arable land, two farm houses, a mansion, a laundry, and a corn mill, for £19,000. It is the intention of the council to use the property partly for the disposal of such refuse as is not already dealt with by the existing sewerage system, and in all probability a destructor will be erected. At present the refuse is taken out to sea in hopper barges and discharged, but for some time past this system has been very costly.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Chertsey R.D.C. (July 21st. Mr. R. G. Hetherington).—£1,793 for works of sewerage, [illegible] Mr. H. Beverley said the expenditure of the sum would be [illegible] £97 9s. 8d. per annum, which was equal to a rate of 7·16d.

Kettering R.D.C. (July 21st. Mr. R. G. Hetherington).—£1,292 for the purpose of providing a water supply in the parish of Cottingham, including the extension of works at Great and Little Oakley.—The details of the scheme were submitted by Mr. Kay, of Messrs. Everard, Pick & Son, engineers. The inspector visited the sites at the close of the inquiry.

Panteg U.D.C. (August 6th. Mr. M. K. North).—£900 for the provision of an open-air swimming bath.—It was stated that the site would be enclosed by iron railings, and that the extension of the area was possible. The water was derived from springs in the red sandstone, and the supply had never been known to stop in the driest summer. There would be a continual flow through the bath.

Prestatyn U.D.C. (August 7th. Mr. H. R. Hepper).—£2,800 for the purposes of water supply including the extension of the works in the parish of Meliden, and £300 for the purchase of land for a recreation ground. The surveyor, Mr. F. Wilkinson, stated that the loan for works of water supply was rendered necessary by building extensions. It was asked that the repayment of the proposed loan should extend over a period of thirteen years. With respect to the purchase money for the proposed recreation ground, it was agreed with the inspector that the period should be twenty years.

Rotherham T.C. (August 6th. Mr. Edgar Dudley).—£2,000 for the purposes of the proposed cattle market, and £14,230 for the purchase of the St. George's Hall and the West Riding Court House for the widening of College-square and Effingham-street.—It appeared from the explanations offered that it is sought to place the proposed market on the site adjoining the new street, which is now known as Corporation-street. As to the College-square improvement, it was stated that the necessity for street widening at this point was great. Under the scheme a street 70 ft. wide with a 46-ft. roadway, will be possible.

Sheffield T.C. (August 6th. Mr. H. Shelford Bidwell).—£3,615 for the purchase of property in West-street and Fitzwilliam-street; £6,200 for the purchase of Bowden Housteads Wood, Handsworth; £3,685 for works of private street improvement in Blast-lane, Cadman-street, Lumley-street, and Edmund-street; and £6,100 for laying out a part of the Abbey-lane cemetery.—The street widenings were described as necessary in view of the increasing traffic, and as to Bowden Housteads Wood, it was stated that it is proposed to purchase about 100 acres for public walks. Details were submitted of the proposed private street works, and of the cemetery extension, for which it is proposed to acquire 15 acres.

Surbiton U.D.C. (October 6th. Mr. Thomas Adams).—This was an inquiry into the council's application for authority, under Part II. of the Housing and Town Planning Act, 1909, to prepare a town planning scheme with reference to an area situate within the urban district, and affecting approximately rather more than half its area, or about 1,607 acres in all. Evidence was given in support of the application by, among others, Mr. H. T. Mather, surveyor to the council. There were only three opponents.

Sutton-in-Ashfield U.D.C. (August 4th. Mr. H. Shelford Bidwell).—£8,600 for the duplication of waterworks plant and water mains. It was stated that there had been a great increase in the demand for water, and that additional pumping machinery and mains were required in order to guarantee a supply to the outside districts. Mr. Hodson, water engineer, gave details of the proposed scheme.

West Kent Main Sewerage Board (August 4th. Mr. R. G. Hetherington).—£35,300 for purposes of sewage disposal, £1,275 for the construction of a light railway at Long Reach, Dartford, and £650 for the redemption of the tithe rent charge upon the land [illegible] Mr. A. B. Coomber, stated that the total quantity of sewage treated [illegible] was [illegible] 3,321,000,000 gallons. The cost of treating 1,000,000 gallons of sewage, inclusive of the maintenance of all sewers and outfall works, all establishment charges and loan payments (principal and interest) was £6 7s., which was easily the lowest of all joint sewerage boards, the average being £17 12s. 1d. The West Kent Board paid higher wages than most authorities, and the men worked fewer hours. The amount of sludge to be dealt with was estimated at 78,000 cub. yds. per annum, equal to a weight of 62,678 tons. The chairman of the board, Sir G. Woodman, said that what they proposed to do would answer the requirements of the district for another ten years.

APPLICATIONS FOR LOANS.

Barking U.D.C. £3,548 for road construction.

Barnsley R.D.C.—£1,728 for a sewerage scheme.

Barrow-in-Furness T.C. £7,900 for works of street improvement.

Bournemouth T.C.—£5,000, additional loan for works at the Underchiffdrive, and £375 for road widening.

Brighouse T.C. £1,400 for works of paving.

Cheshire C.C. £5,751 for road construction.

Chorley T.C. £4,700 for road works.

Congleton R.D.C.—£2,100 for a sewerage scheme.

East Preston (Sussex) R.D.C.—£1,000 for the construction of four groynes, and other works.

Grimsby T.C.—£4,600 for the purchase of land for recreation, cemetery, and other purposes.

Hereford T.C. £1,000 for new water mains.

Maidenhead T.C.—£250 for road improvement.

Merthyr T.C.—£1,750 for school extension.

St. Albans T.C. £18,976 for sewering and sewage disposal.

Thornbury R.D.C. £2,240 for the erection of eight houses.

Ulverston U.D.C. £976 for cookers and prepayment meters.

Ventnor U.D.C.—£393 for a compound steam roller.

Wallasey T.C.—£1,480 for bowling greens and shelters.

Wigan T.C.—£2,000 for conversions to the water-carriage system.

LOANS SANCTIONED.

Bacup T.C.—£1,200 for sewerage work.

Chorley T.C.—£9,800 for prospective expenditure upon gas mains, and other equipment.

Cork T.C.—£2,250 for machinery at the waterworks.

Islington B.C.—£9,147 for paving works.

Lincoln T.C.—£7,000 for water mains extension; £8,500 for the purchase of a site for a housing scheme.

Lurgan U.D.C.—£2,000 for the purposes of the housing scheme.

Maidenhead T.C.—£200 for the improvement of the river side promenade.

Oswestry R.D.C.—£900 for the Weston Rhyn waterworks.

Rotherham T.C.—£19,432 for the purposes of the electricity undertaking.

St. Annes-on-the-Sea U.D.C.—£39,100 for sewerage works.

Southwick U.D.C.—£950 for private street works.

Torquay T.C.—£5,000 for extensions of electric light mains (repayment in twenty years).

Walton-on-the-Naze U.D.C.—£200 for the purchase of land for a depot.

Whitefield U.D.C.—£350 for the extension of the municipal offices.

Wirksworth U.D.C.—£160 for the installation of automatic controllers on street lamps.

FORTHCOMING INQUIRIES.

AUGUST. £

18. **Cottingham.** For works of sewerage (Mr. M. K. North) 2,900

		£
18.	**Middleton.** For electricity works extension (Mr. H. R. Hooper)	7,160
18.	**Poulton-le-Fylde.** For private street works (Mr. F. H. Tulloch)	593
18.	**St. Just.** For a water supply scheme (Mr. A. W. Brightmore)	
18.	**Scarborough.** For works at South Cliff gardens (Mr. P. M. Crosthwaite)	16,070
19.	**Angleton.** For works of sewerage (Mr. F. H. Tulloch)	340
19.	**Penzance.** For burial ground extension (Mr. A. W. Brightmore)	2,000
19.	**Pickering.** For works of water supply (Mr. P. M. Crosthwaite)	700
19.	**Rotherham.** For the purposes of street improvement (Mr. M. K. North)	2,412
19.	**Sleaford.** For the purchase of market tolls (Mr. R. C. Maxwell)	2,300
20.	**Finchley.** For works of surface-water drainage (Mr. H. Shelford Bidwell) ...	
20.	**Grimsby.** For the purposes of sewage disposal (Mr. P. M. Crosthwaite)	20,264
20.	**Kingston-on-Hull.** For the erection of a sanatorium (Dr. A. S. MacNalty)	14,438
20.	**Plymstock.** For works of water supply (Mr. A. W. Brightmore)	877
20.	**Rochdale.** For the purchase of a recreation ground (Mr. F. H. Tulloch)	1,665
20.	**Welwyn.** For works of sewerage (Mr. M. K. North)	400
21.	**Atherton.** For the purposes of the electricity undertaking (Mr. H. R. Hooper)	2,100
21.	**Huntingdon.** For burial ground extension (Mr. M. K. North)	—
21.	**Hyde.** For works of sewerage (Mr. F. H. Tulloch)	1,207

£1,000,000 FOR ROAD WORK.

The disorganisation of business consequent upon the European War will undoubtedly throw upon the market a vast amount of partially skilled and unskilled labour. This in turn will cause widespread distress among this class of the community, and their dependents, which will need to be relieved by the various agencies now being established. Under its statutory constitution the Road Board has available a considerable sum—at present over £1,000,000—to provide work upon the roads at such times as these. The Roads Improvement Association is therefore compiling, as rapidly as possible, for submission to the local authorities and the Government departments, a series of suggestions for road improvements in various areas upon which this unemployed labour could be most usefully utilised. The various provincial branches of the Roads Improvement Association have been asked to send in lists for their respective districts. Readers not in touch with any of the Road Improvement Association's branches, who would like to submit proposals, should address communications to the general secretary of the association (Mr. Wallace E. Riche, 15 Dartmouth-street, Westminster, London, S.W.). Details should be forwarded of trunk and important roads that need widening, strengthening and resurfacing where the minimum amount of land is required, or where it can be acquired without much difficulty. Also where the maximum amount of labour will be needed, and where any materials required can, in the main, be obtained locally. Each suggestion forwarded should be accompanied with a note upon the facilities, such as land, material, &c., that are available, and the benefits that will accrue from the proposed works. It will be appreciated that the earlier attention is given to this matter the more opportunities there will be to direct labour and money to works of real public utility and avoid relatively unproductive expenditure.

Northwich Meeting Postponed.—The district meeting of the Institution of Municipal and County Engineers, which it had been arranged to hold at Northwich on September 4th, will not take place.

LOCAL AUTHORITIES AND THE WAR.

Six of the eleven horses owned by the Malden and Coombe Urban District Council have been taken for Army transport purposes.

All employees of the Cardiff Corporation who have been called upon to serve are to be given leave of absence during their military service, and will at the end of the war be reinstated without loss of position or emoluments. The council will pay them, or any person or persons they may appoint, such sums as with the pay they will receive from the Government, will make up their full salaries or wages.

The surveyor to the Plympton Rural District Council, Mr. M. Wickett, informed the council that the War Department had taken so many horses from the district that he was finding great difficulty in continuing the work on several of the roads. After discussion, it was agreed that the surveyors must do the best they could under the circumstances.

It has been agreed that all employees connected with the Newcastle-on-Tyne Town Council who have been called to the colours shall not, on their return, be placed in a worse position than they were in leaving to undertake military duties, and that financial aid shall be given to their wives and children.

At the meeting of the Newport (Mon.) Corporation on Tuesday, Mr. E. A. Charles asked that the Works Committee should consider what schemes, if any, could be submitted to the Development Commissioners, with a view of providing as much work as possible in the town. Alderman Greenland: We are doing that now. Mr. J. Moxon: Even to-day we are sanctioning work which will cost £30,000.

At the quarterly meeting last week of the Roads and Bridges Committee of the East Suffolk County Council, the county surveyor, Mr. W. Jarvis, stated that the committee got most of their stone from foreign parts, and owing to the war he wished for authority to purchase stone from other sources if they were to continue work. The committee decided to continue work, and that on the question of obtaining stone, the chairman and county surveyor should consult each other.

The Queen's-road school, Wimbledon, has been placed at the disposal of the local Voluntary Aid Detachment of the British Red Cross Society, for hospital purposes if required; and the town council will also give the society the use, if required, of their new motor ambulance, which the contractors have undertaken to complete without delay. It has also been decided that the position of every man in the corporation's service who is called up for service shall be kept open for him, and that the wives of those who are married shall receive 15s., and each child 2s. 6d. per week, with a maximum payment of 25s. The place of any man who volunteers for service will also be kept open, and his circumstances will be considered by a special committee of the council. Twenty of the council's stud of horses have been commandeered by the War Office.

The directors of Claridge's Patent Asphalte Company, Limited, announce that they are paying to the wives of all men in their employment who are serving the country in any branch of H.M. Service the difference between the pay of the latter as combatants and their average weekly wages. In addition, the firm are keeping the men's positions open until their return from service.

Until further notice, the head office of the Automobile Association, Fanum House, Whitcomb-street, London, W., will be open day and night, including Sunday, for any urgent messages, telegrams (Fanum, London), or telephone calls (300 Regent). This will apply to the principal provincial branch offices at Manchester (5489 City), Leeds (2027 Central), Birmingham (973 Central), Exeter (1000 Exeter), also Scotland at Glasgow (7199 Central).

New Electricity Works for Rhyl.—The new electric lighting plant for Rhyl, which has been installed at a cost of £4,000, was inaugurated formally last week.

Kent County Fencing Company.—The Kent County Fencing Company, of Crouch, Borough Green, Kent, were last week successful in obtaining the silver medal for the best stand in the miscellaneous display at the Tring Park Agricultural Show.

Municipal Work in Progress and Projected.

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[illegible] £21,147. Newport [illegible] £2,000. Worcester [illegible] Halifax £3,000. Newport £21,000. Leyton £15,000. Wolverhampton £9,000. Parry [illegible] Board Inspector [illegible]

BUILDINGS.

Bournemouth T.C.—Tenders have been accepted for the erection of refreshment rooms at the West Cliff (estimated to cost £565) and the East Cliff (estimated to cost £500).

Chichester T.C.—Plans of proposed bridges at Donnington and Birdham, estimated to cost £1,000 each, have been submitted to the county council. Each bridge is to be capable of carrying 30 tons.

Glasgow T.C.—In a report to the Parks Committee Mr. [illegible] W[illegible] [illegible] the cost of erecting a [illegible] on the site of the [illegible] in Kelvingrove Park [illegible] of waiting [illegible] are very much required in that part of the park.

Hastings T.C.—The tender of Messrs. Braithwaite & Kirk, of London, at £16,000 has been accepted for extension work in connection with the pier scheme.

Hythe T.C.—The council at its meeting recently received a letter from the Board of Trade consenting to the erection of the last new groyne. The letter, we read in the *Folkestone Herald*, was received with laughter, as the groyne had been erected several weeks.

Kingston-on-Thames T.C.—The council have adopted the estimate of the borough surveyor, Mr. R. H. Clucas, at £212, for the provision of flooring for the swimming bath.

Lindsey C.C.—It has been decided to build a school for 400 girls at Ashby.

Surrey C.C.—The tender of Messrs. S. Kavanagh & Co., at £474, has been accepted for the widening of certain bridges at Tolworth.

Wallasey T.C.—The borough engineer has received instructions to report upon the desirability or otherwise of providing public washhouses on a portion of land which forms part of a site acquired for recreation purposes.

Westhoughton U.D.C.—Information is to be obtained with respect to the cost of construction and maintenance of open-air baths.

HOUSING AND TOWN PLANNING.

Dewsbury T.C.—The council have approved the plans of the borough surveyor, Mr. H. Dearden, for the erection of eighty-seven working-class dwellings in Old Borough Road at an estimated cost of £24,147.

Horwich U.D.C.—The surveyor, Mr. T. Green, has received instructions to prepare plans for working-class dwellings.

Newport (Mon.) T.C.—The council on Tuesday agreed to purchase the Somerton estate, for the erection of 100 workmen's houses.

Pontypool U.D.C.—It has been decided to proceed immediately with the erection of further houses under the Housing of the Working Classes Act.

Seaford U.D.C.—The surveyor, Mr. B. A. Miller, has received instructions to prepare plans and estimates for the erection of two cottages in Chichester-road.

Winchcombe R.D.C.—A tender, at £1,076, has been accepted for the erection of six cottages at Alderton, and another tender at £391, for two cottages at Snowshill.

PARKS AND OPEN SPACES.

Merton and Morden U.D.C.—The recommendation of the General Purposes Committee has been adopted to purchase the Whatley estate, consisting of 14½ acres, at the price of £3,500, for the purpose of a recreation ground.

ROADS AND MATERIALS.

Aberdeen C.C.—The council have agreed to the application of the Aberdeen District Committee to provide and maintain a motor-car for the use of the road surveyor, and to fix the latter's salary at £250 per annum.—It has been resolved by the Aberdeen District Committee to reconstruct by tar consolidation a ½ mile on the Deeside-road a portion of an experimental section which was laid down in 1908. The committee have also decided to repaint the whole of the section on the Deeside route, the ½ mile laid at Culter, and the whole of the section on the Inveruric-road, at an estimated cost of £796. An application is to be made to the Road Board for a grant towards the cost of the improvements.

Abergele and Pensarn U.D.C.—The tender of the Penmaenmawr Granite Company has been accepted for the supply of large quantities of macadam.

Amesbury R.D.C.—The surveyor, Mr. J. T. Huxham, has advised the council to repair short lengths of the Butford-cross roads with a bed of 4-in limestone covered with good, hard granite, at an estimated cost of £255. The council are seeking to obtain a contribution towards the cost of the work from the War Office.

Banbury T.C.—The Road Board have sanctioned a grant of £150 to the council for the purpose of tar-grouting.

Bournemouth T.C.—The general manager of the tramways has received instructions to prepare forms of tenders for the partial reconstruction of the tram line and roadway in Holdenhurst-road, at an estimated cost of £10,000.

Cambridge C.C.—A motion has been adopted directing the Roads and Bridges Committee to consider whether the county roads cannot be repaired "without causing obstruction and danger to traffic."

Chatham T.C.—In pursuance of a report by the borough surveyor, Mr. C. Day, with respect to the cartage of road materials and house refuse, the council have decided to purchase one tractor from Messrs. Aveling & Porter at £138, and three trucks at £63 12s. 4d. each.

Cheriton U.D.C.—A scheme of improvement for High-street has been adopted. It is proposed to carry out the work in three sections, at an estimated cost of £3,000.

Cork T.C.—The Public Works Committee have been asked to prepare a scheme for the improvement of the streets of the city.

East Riding C.C.—The sub-committee appointed to deal with the question of the widening of the main road between Beverley and Hull recommend that the necessary land be purchased from the North-Eastern Railway Company at the price of £600 an acre, and that the county surveyor, Mr. J. Bickersteth, be instructed to prepare detailed plans and specifications for the proposed improvement.

Newhaven R.D.C.—The surveyor, Mr. Arthur C. Groves, reports that in order to make a satisfactory job of the Newhaven-Seaford road it will be necessary to break up the surface and lay down a good, hard foundation. The matter has been referred to the Highways Committee.

Normanton U.D.C.—The surveyor, Mr. A. Hartley, has received instructions to prepare plans and specifications for making up Woodhouse Mount, under the Private Street Works Act, 1892.

Richmond (Surrey) T.C.—The tender of Messrs. Mowlem & Co., Westminster, at £568, has been accepted for making up North-road under the Private Street Works Act, 1892.—Messrs. Mowlem have completed the work of making up the remainder of Leyborne-park, and also the paving of St. Helena Wharf.

Surrey C.C.—It has been agreed to contribute a sum not exceeding £417, one-third of the estimated cost of the purchase of land for widening the London road at Guildford.

Thingoe R.D.C.—With regard to the motor bicycle owned by the district surveyor, Mr. A. R. Cameron, it

has been agreed to grant him in future £20 per annum. In reply to a question as to how many miles he covered in a year, the district surveyor suggested 10,000 miles.

Uckfield R.D.C.—The surveyor, Mr. E. Johnson, reported recently that, as the Rocmac laid last year proved so successful, and £125 having been allowed in the estimates for similar work this year, he proposes with the council's permission to use Rocmac for 200 tons of Quenast granite in Myrtle or Maynards Gate roads, Crowborough, and 200 tons of Jersey granite on the Piltdown-road, Fletching.

Walton-on-Thames U.D.C.—The surveyor, Mr. R. Wilds, submitted recently a report on the final apportionment in connection with the making up of Drewitt's-court under the Private Street Works Act. The cost was £296, and the apportionment 6s. 7.38d. per foot, as against the provisional figure of 7s. 10¾d. The reduction was accounted for chiefly by the fact that the work was carried out departmentally instead of by a contractor, the contractor's profit consequently being saved to the frontagers. The chairman, Mr. E. Martin, said he had seen the particular work, and he thought the surveyor had made a very good job of it. It was a very great improvement.

SEWERAGE AND SEWAGE DISPOSAL.

Biddulph U.D.C.—A deputation has been appointed to meet representatives of the Leek Rural District Council, with a view to arriving at a settlement on the Horton sewerage proposals.

Crompton U.D.C.—Proposals are under consideration for the extension of the Low Crompton sewage disposal works, at an estimated cost of £2,000.

Easthampstead R.D.C.—The council have adopted a scheme for sewage disposal for the Binfield district, at an estimated cost of £9,661.

Fifeshire C.C.—The new sewage disposal works constructed by the Kirkcaldy District Committee at Auchterderran were formally opened recently. The works, which were designed to prevent the pollution of the river Ore, have cost between £9,000 and £10,000. The plans were prepared by Messrs. Gilbert Thomson & Ferguson, of Glasgow, and the contractors were Messrs. David Adamson & Co., of Cowdenbeath.

Hailsham R.D.C.—The tender of Messrs. A. Streeter & Co., of Guildford, at £4,933, has been accepted for carrying out the Polegate drainage scheme.

Leyburn R.D.C.—The tender of Mr. A. Scholefield, of Thorne, Leeds, at £2,100, has been accepted for the execution of the Middleham sewage disposal scheme.

Lichfield R.D.C.—The tender of Messrs. G. P. Strentham, of Birmingham, at £6,410, has been accepted for the Burntwood sewage disposal scheme.

North Walsham U.D.C.—A letter has been received from the Local Government Board pressing upon the council the urgency of adopting a scheme for sewage disposal, and stating that the board cannot admit that the result of a poll of the ratepayers relieves them from the responsibility for the public health.

Poole T.C.—The council have adopted the scheme of the borough surveyor, Mr. S. J. Newman, for surface-water drainage in York-road and Queen's-road, at an estimated cost of £654.

Worcester T.C.—Consideration has again been given to the proposed sewerage scheme, with reference to which there has been correspondence with the Local Government Board, and a resolution has been adopted by the council that upon receiving reports from the engineers they would be prepared to carry out such further works as might be necessary to make the scheme satisfactory to the board.

WATER, GAS, AND ELECTRICITY.

Berwick T.C.—Application has been made to the Local Government board for an extension of the time for the repayment of the loans for the Joint Water Scheme and the drainage of Tweedmouth, in view of the fact that the cost of the scheme has exceeded expectations.

Gloucester T.C.—The tender of Messrs. E. Timmins & Sons, Limited, Runcorn, has been accepted for making and lining a well or borehole; also the tender of the Premier Gas Engine Company, Limited, Sandiacre, near Nottingham, for providing and erecting air compressing engines, machinery, and plant at Ketford waterworks.

Halifax T.C.—A 12-in. main is to be laid from the Albert reservoir to Rolls Head-road, at an estimated cost of £2,000.

Nantwich R.D.C.—The water supply scheme for Audlem and district, estimated to cost £21,000, has been approved by the Local Government Board, and the sanitary surveyor, Mr. C. E. Davenport, has been instructed to obtain tenders.

Stafford T.C.—Water main extensions are to be carried out, at an estimated cost of £350.

Tanderagee R.D.C.—The council have forwarded to the Local Government Board a report by Messrs. Kaye, Parry & Ross, of Dublin recommending a scheme of water supply from wells by means of pumping.

Torquay T.C.—The Waterworks Committee recommend the council to commence the laying of a further section of the new duplicate main from Hennock to Sandford Orleigh, Newton Abbot, a distance of about 9,600 yds., at an estimated cost of £18,000, and that application be made to the Local Government Board for sanction to a loan for the purpose.

Walsall T.C.—The council have decided to build a new gas-holder, at an estimated cost of £9,000.

MISCELLANEOUS.

Torquay T.C.—A special sub-committee has submitted a report that, having regard to the amount and importance of the work for which the borough surveyor's department was responsible, they did not think it possible to make any reduction in the staff if the work were to be carried on in a satisfactory and efficient manner. They recommended that all workmen over seventy years of age should be required to apply for an old-age pension, the council to augment such sum up to the maximum allowed under the Old-age Pension Acts.

PERSONAL.

Mr. W. Wright, borough surveyor of Grantham, has received an increase of salary of £25 a year.

Mr. J. W. Croxford, surveyor to the Brentford Urban District Council, has had his salary advanced to £300 per annum.

Mr. Gordon R. Folland, chief assistant to the county surveyor, Northern Division, Devonshire, has been appointed assistant county surveyor to the Somerset County Council.

Mr. R. T. Davis, of Birmingham, has been appointed quantity surveyor in connection with the new offices scheme for the Barnet Urban District Council, at an inclusive commission of 2½ per cent.

Mr. E. H. Calcutt, Assoc.M.Inst.C.E., has been engaged by the Surrey County Council to undertake the surveys and preparation of estimates for dealing with dangerous corners at a salary of £4 4s. a week and travelling expenses, repayable by the Road Board.

Mr. Edwin Brown, surveyor to the Burgess Hill (Sussex) Urban District Council, has received an honorarium of ten guineas for extra services in preparing plans and carrying out the construction of the automatic filter-beds at the sewage farm. The Works Committee, a councillor stated, had no hesitation when the question was started as to how the work should be carried out in putting it in charge of the surveyor, because they knew he would carry it out thoroughly. The work had been very satisfactory, and the honorarium was a small complimentary assurance of the council's appreciation of his services.

Mr. J. Stanley Sawdon, Assoc.M.Inst.C.E., deputy surveyor of Margate, has been appointed surveyor of St. Annes-on-Sea, at a commencing salary of £250 per annum, with the privilege of taking articled pupils. St. Annes-on-Sea, Lancashire's residential suburb, is one of the newest, pleasantest and healthiest of coast towns, situated between Blackpool and Lytham. The town was designed on spacious garden city lines; it is quite modern; there is not a building forty years old, and during the last ten years the population has more than doubled, and is now 11,000 in the winter and 30,000 in the summer. The rateable value is £100,000. The streets are wide, with residences detached and semi-detached, and there is a uniformity in the size of dwellings in the various thoroughfares, with diversity of architecture. Marine gardens, profuse with

[illegible]

Mr. J. Stanley Sawdon.

[illegible] at Margate appointments at Cheltenham, Staines, Kettering, Uxbridge, Northwood Hills and Chertsey.

Those of our readers who met Mr. E. L. Powers, the president of the company which publishes *Good Roads*, at the International Road Congress last year, will be sorry to hear that he recently met with a serious accident when driving in his car from New York to his farm at Jamestown, a distance of about 700 miles. Mr. Powers was accompanied by Major W. W. Crosby, who is personally well known to many surveyors and engineers in this country, and who has contributed to our columns several most valuable papers on the subject of road construction and maintenance. It appears that everything went well until the party were within 10 miles of their destination, when, in going around a turn of a by-road, the car skidded out of the road, over the edge of the embankment, ran down into a sloping field and turned completely over, coming up on its wheels again, and stopping. Mr. Powers was caught under the steering wheel as the car went over, and when the latter righted was left lying on the ground in the midst of the luggage which had been dumped. He was able to walk to a house close by, but his injuries were found to be such that it is expected he will be obliged to remain in hospital for some five or six weeks. We greatly regret to learn of the accident, and offer our sympathy to the American Road Builders' Association, of which Mr. Powers is one of the three members who form the Executive Committee, being also secretary to the association.

FOR OTHER ADVERTISEMENTS

See End of Paper.

COUNTY BOROUGH OF WALLASEY.

FOR SALE.

12-TON STEAM ROAD ROLLER.

The Works Committee of the Wallasey Corporation have for Sale a 12-ton Steam Road Roller (supplied by Messrs. Aveling & Porter in the year 1899). For particulars apply Borough Engineer and Surveyor, 18 Falkland-road, Egremont, Wallasey. Offers to be submitted not later than noon on Wednesday, August 26th, 1914.

(By order)

H. W. COOK,
Town Clerk.

Town Hall,
Wallasey.
August 13th, 1914. (1855)

FRIERN BARNET URBAN DISTRICT COUNCIL.

ROAD MAKING

ALEXANDRA ROAD AND ATHENÆUM ROAD (parts of).

The undersigned Council invite Tenders from experienced Road and Sewer Contractors for Kerbing, Channelling, Severing, Making Up, &c., Alexandra-road (part of), in the Districts of Friern Barnet and Wood Green, and the Eastern portion of Athenæum-road, Whetstone, N., in the District of Friern Barnet.

Forms of Tender and full particulars can be obtained from Mr. E. J. Reynolds, ASSOC.M.INST.C.E., the Council's Engineer and Surveyor.

Sealed Tenders should be delivered to me on or before Noon on Thursday, 3rd day of September, 1914.

The Council does not bind itself to accept the lowest or any Tender.

(By order)

EDWIN GOODSHIP,
Clerk to the Council.

Council Offices,
The Priory,
Friern Barnet, N.
August 12, 1914. (1854)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

RECONSTRUCTION OF FINGRINGHOE BRIDGE, WIVENHOE, NEAR COLCHESTER.

Tenders are invited from Contractors licensed to execute Ferro-concrete work on the Hennebique system for the Erection of a New Bridge over the Roman River, in the Parish of Fingringhoe, Wivenhoe, near Colchester.

Drawings may be seen, and Specifications obtained, on and after Wednesday August 19th, 1914, upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Fingringhoe Bridge, Wivenhoe," to be delivered to this Office not later than the first post on Monday, August 31st, 1914.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
August 13, 1914. (1856)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

RECONSTRUCTION OF LANGFORD BRIDGE, MALDON.

Tenders are invited from Contractors licensed to execute Ferro-concrete work on the Hennebique system for the Erection of a New Bridge over the River Blackwater, in the Parish of Langford, near Maldon.

Drawings may be seen, and Specifications obtained, on and after Tuesday, August 18th, 1914, upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Langford Bridge, Maldon," to be delivered to this Office not later than the first post on Monday, August 31st, 1914.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
August 13th, 1914. (1857)

GENTLEMAN, with good introductions and connection among Architects, Engineers, and Contractors required to represent leading Asphalt concern in Devon and Cornwall on commission basis. —Apply Box 1457, office of THE SURVEYOR, 24 Bridelane, Fleet-street, E.C. (1853)

SOUTHAMPTON'S TAR-MACADAM PLANT.

VISIT OF SURVEYORS.

By the courtesy of Mr. J. A. Crowther, the borough engineer and surveyor of Southampton, the members of the combined drying and mixing plant recently installed by the Southampton Corporation at their West Shore depot.

Fortunately, the day chosen proved to be exceptionally fine, so that the visitors were able, not only to inspect the production of tar-macadam by the plant, but to see the material actually being laid on the roads, and, in addition, to examine roads which had been previously laid, and are at the present time carrying the material to which previous reference has been made.

To those engineers who were invited to be present it may be of interest to give a brief account of the meeting.

A visit was paid to the depot at West Shore, where the next tar is added, and in a short space of time the whole mass of stone is thoroughly incorporated and coated with the binder. The discharge from the mixer is so arranged that the material falls direct into a cart beneath the mixer in the frame of the plant.

On the day of the visit referred to the machine was [illegible] one carload of mixed material every quarter of an hour, a carload representing between 25 and 30 cwts.

At the West Shore depot, apart from the men engaged in feeding stone to the elevating skip, two men only are occupied in controlling and running the drying and mixing machine. One man is essentially occupied in the general control of the discharge of stone through the plant, while the duty of the second is to add the tar to the stone and discharge the mixed product to carts when ready. As each cart is filled, it is taken direct to the scene of laying operations on the road and immediately deposited. Under the present arrangement of working no storing of the mixed material is introduced, and it is found that the machine is capable of readily supplying the demands

Ransome Combined Drying and Mixing Plant at Southampton.

on the 10.15 train, reaching Southampton shortly before 12, when they were joined by others who had come from the surrounding districts, and, in some cases, from considerable distances, their journey not necessitating their coming through London. Altogether a party of about thirty-five assembled, and, firstly, the opportunity was taken of inspecting the combined drying and mixing plant at work in the West Shore depot. The machine itself is illustrated on this page, and it may be well to describe the general operation of the equipment.

As will be seen from the photograph, the stone is fed to the elevating skip placed at one end of the machine. This skip raises the stone to what is known as the feeding hopper, whence it enters the first of two revolving drums. After the stone has remained in the first drying drum, undergoing the drying process for from two to three minutes, it is discharged into the second of the drying drums, where it undergoes further drying, the second batch meanwhile being introduced through the hopper of the first drum. From this it will be seen that two batches of stone are continually undergoing the drying process simultaneously, the batch contained in the second of the two drums being discharged through a chute, under the control of the operator, into the mixing portion of the equipment. When the dried stone reaches the of the road makers, the output from the equipment averaging from 45 to 60 tons per day.

After the examination of the plant, a considerable number of the party took the opportunity of visiting the roads where road laying was in actual process, witnessing *en route* roads which had been made by the mixed material produced from the machine.

Subsequent to this an adjournment was made to the South-Western Hotel, where luncheon was provided by the Ransome-verMehr Machinery Company, Limited, of Brunswick House, Westminster, the suppliers of the combined drying and mixing plant.

At the luncheon the chair was taken by Mr. C. F. Gettings, the county surveyor of Worcestershire, and as is, perhaps, usual on such occasions, lunch was followed by one or two speeches by members of the company, the trend of which was to express the acknowledgment of everybody present of the extreme courtesy of Mr. J. A. Crowther and his worthy lieutenant, Mr. A. E. Dixon, who not only laid themselves out to provide every facility for seeing what Southampton is doing in maintaining its roads and highways, but were only too pleased to supplement actual observations by detailed information which they had naturally obtained as a result of the working experience of the plant referred to.

After luncheon, it was found that some members

[illegible] the party [illegible] to return to the depot, while [illegible] took a further opportunity of seeing the road [illegible] and [illegible] time was [illegible] occupied until the party broke up in order to return to [illegible]

[illegible] that all arrangements seemed to be [illegible] thought out, and, apart from [illegible] which were [illegible] at the disposal of [illegible] Mr. [illegible] and Mr. Dixon, [illegible] from the depot to the roads, &c., was materially [illegible] by the [illegible] Motor Machinery Company, Limited, of several additional cars, the result being that everybody seemed able to go exactly where they wished, and to see exactly what they wished.

[illegible] that we endorse the opinion expressed by Mr. Gettings that meetings such as this are of material advantage in assisting all those interested in the maintenance of roads in appreciating developments which are taking place from time to time, and thereby obtaining information, not only of [illegible] surveyors, but also to the community at large.

SOME RECENT PUBLICATIONS.*

CLEAN WATER AND HOW TO GET IT. By Allen Hazen. (Second edition, revised and enlarged.) Price 6s. 6d. nett. London: Chapman & Hall, Limited.

"Taking it right through, probably one half the water supplied to American cities is wasted" is one of the statements made by Mr. Allen Hagen in his most interesting and valuable book. As will be seen, he does not spare criticism where it is required, but neither does he fail to show the great advances made recently in America, and the perfection of methods where deserved.

Although the problems which confront the American engineer differ considerably from those which have to be dealt with in this country, all English water engineers will do well to read Mr. Hagen's work, and will learn much therefrom which may be applied usefully to work at home. The quality of waters derived from lakes and rivers is specially considered, and the best methods of treatment are very clearly described. The important questions of the action of water on pipes, red water or rust troubles, the nature and methods of purifying water and disinfection, are considered; while the book also treats of the storage of filtered water, the required sizes of filters, the pressure under which water is delivered, the use and measurement of water by meters, the laying-out of works, and financial matters.

It seems to be inferred that all the really important methods of purification in general use are described, and if this claim is made it certainly appears that the Puech Chabal system ought to have been mentioned, seeing that it has been installed at many large and important works. Also it would have been interesting to have read the author's remarks upon the rotary sprinkler used on the slow sand filter, which may be seen in this country at such works as Bedford, and which seems to have been used with great success in France.

Again, the author appears to claim that the use of hypochlorite of lime for the sterilisation of water dates from the application of hypochlorite to the Jersey City water in the year 1908. The water supply of Lincoln was sterilised by hypochlorite in this country in the year 1904.

From other remarks made by Mr. Hagen it seems that it would be of material advantage on both sides if English and American engineers were better informed of each other's progress, or lack of progress. A careful study of Mr. Hagen's book is therefore advised.

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

CROYDON RELIEF ROAD.

LOAN SANCTIONED.

[illegible]

The estimates for this work include, we believe, [illegible] rials. Such a work as this, if put in hand at once, [illegible] wise be out of work.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. PICKERING, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

Owing to recent happenings, it has been decided to abandon the visit to Hunstanton, which was announced for the 15th inst. The visit to the South Metropolitan Gasworks, arranged for the 13th inst., has also been abandoned.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

COUNTY SURVEYOR'S ENGINEERING ASSISTANT.—August 17th.—County Council of Salop. £3 3s. per week.—Mr. A. T. Davis, county surveyor, County Buildings, Shrewsbury.

COUNTY SURVEYOR.—August 19th.—Longford County Council. £250.—The Secretary, County Council Office, Longford.

ROAD FOREMAN.—August 19th. — Cheltenham Town Council. 40s. per week.—Mr. J. S. Pickering, borough engineer.

CHIEF ENGINEERING ASSISTANT. — August 20th.—Corporation of Bedford. £150—£200 per annum.—Mr. N. Greenshields, borough engineer and surveyor, Town Hall, Bedford.

ARCHITECT'S CLERK.—August 22nd.—Felling-on-Tyne Urban District Council (Education Committee). —Mr. R. Hall, clerk.

SURVEYOR AND INSPECTOR. August 28th. Mere (Wilts) Rural District Council. £150 per annum. —Mr. R. H. Hiscott, clerk, Council House, Mere.

ASSISTANT ROAD SUPERINTENDENT.—August 25th.—Wandsworth Urban District Council. Salary [illegible] per week.—Mr. O. C. [illegible], engineer, Municipal Offices, Dyneley-road, Kilburn, N.W.

SANITARY INSPECTOR.—August 25th.—Lewes Division of the county of Ross and Cromarty. £160 per annum, with expenses.—Mr. H. Miller, district [illegible], Stornoway.

TEMPORARY SURVEYOR'S ASSISTANT.—August 27th.—Isle of Thanet Rural District Council. £2 2s. per week.—Mr. Chas. Taylor, clerk, Board Room, Minster, near Margate.

GENERAL FOREMAN.—August 27th.—Corporation of Wokingham. 37s. 6d. per week.—Mr. C. W. Marks, borough engineer and surveyor.

CLERK OF WORKS.—August 27th.—Fleet (Hants) Urban District Council. £4 4s. per week.—Mr. W. H. Wright, clerk.

SURVEYOR'S ASSISTANT.—August 29th.—Uxbridge Rural District Council. £2 per week.—Mr. C. Woodbridge, clerk, 38 High-street, Uxbridge.

CLERK OF WORKS.—Langport Rural District Council. £2 2s. to £3 3s. per week, according to experience and suitability.—Mr. J. Mathison, Langport.

HIGHWAY SURVEYOR.—Boston Rural District Council. £140 per annum.—Mr. H. Smith, clerk, 10 New-street, Boston.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LONDON.—September 7th.—Designs for two new schools, for the London County Council.—The Clerk, Spring-gardens, London, S.W.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ROCHFORD.—August 17th.—For the erection of four cottages, for the rural district council.—Mr. O. C. Madge, surveyor.

EVESHAM.—August 17th.—For the erection of thirty workmen's houses, for the rural district councils of Evesham and Pebworth.—Mr. E. H. Wadams, clerk, Union Offices, Evesham.

BRISTOL.—August 18th.—For the erection of public baths, for the corporation.—Mr. L. S. McKenzie, city engineer and surveyor.

ALDERSHOT.—August 18th.—For extensions to electricity buildings, for the urban district council—The Surveyor.

SOMERSET.—August 18th.—For the erection of a school, for the Education Committee.—Mr. A. J. Pictor, architect, Bruton.

COOKHAM.—August 18th.—For the removal of existing bridge, and building a wood and girder bridge, for the rural district council.—Mr. R. Stuart Lloyd, district surveyor, Queen-street Chambers, Maidenhead.

BARNET.—August 19th.—For the erection of twenty-four cottages, for the rural district council.—Mr. A. J. Wilshire, surveyor, Shenley-road, Boreham Wood.

BLACKPOOL.—August 19th.—For extensions to abattoir buildings, for the corporation.—Mr. J. S. Brodie, borough surveyor.

HERTS.—August 20th.—For the erection and completion of a new special subjects centre at Stevenage, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

BARNSLEY.—August 21st.—For the erection of an open-air school, for the Education Committee.—Mr. E. W. Dyson, architect, Regent-street, Barnsley.

EASTRY.—August 24th.—For the erection of six cottages, for the rural district council.—Messrs. Jennings & Gray, 4 St. Margaret's-street, Canterbury.

TREDEGAR.—August 24th.—For the erection of a fire station at Harcourt-terrace, Tredegar, for the urban district council.—Mr. W. Edgar Jones, architect, 1 Commercial-street, Tredegar.

ST. AUSTELL.—August 25th.—For the erection of thirty-two workmen's dwellings, for the rural district council.—Mr. W. H. Moffat, surveyor.

LANCASHIRE.—August 25th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, architect, 16 Ribblesdale-place, Preston.

ABERTILLERY.—August 26th.—For alterations and extensions to a school, for the Education Committee.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

BRIGHTON.—August 27th.—For the erection of a clock tower in Queen's Park, for the corporation.—Borough Surveyor.

GWYRFAI.—August 28th.—For the erection of thirty-six workmen's dwellings, for the rural district council.—Mr. J. W. Thomas, surveyor, 22 Castle-square, Carnarvon.

NORTH RIDING.—September 4th.—For the erection of a school, for the Education Committee.—Mr. J. C. Wrigley, secretary, Education Offices, Northallerton.

SHEERNESS.—September 7th.—For the demolition of engine-house and the construction of a new building and other works, for the urban district council.—Mr. F. W. S. Stanton, engineer, 3 Victoria-street, Westminster, S.W.

Iron and Steel.

MARPLE.—August 19th.—For the supply of spigot and socket cast-iron or steel gas mains, for the Gas Committee.—Mr. J. K. Law, gas engineer, Marple Bridge.

MANCHESTER.—August 25th.—For the supply of cast-iron pipes for heating purposes, for the Tramways Committee.—Mr. J. M. McElroy, general manager, Corporation Tramways, 55 Piccadilly, Manchester.

KEIGHLEY.—September 5th.—For the supply of cylinders for reservoir works, for the corporation.—Mr. M. R. Barrett, engineer, Town Hall.

Roads.

SPENNYMOOR.—August 17th.—For making up a certain road, for the urban district council.—Mr. C. R. Spencer, surveyor.

WIGTON.—August 17th.—For the road maintenance of certain districts, for the rural district council.—Mr. T. B. Simmons, surveyor.

REIGATE.—August 18th.—For supplying and laying creosoted wood block paving, for the corporation.—Mr. F. T. Clayton, borough surveyor.

ISLE OF WIGHT.—August 19th.—For the execution of road improvements, for the rural district council.—Mr. L. A. Cozens, surveyor, Walmer Villa, Castle-road, Newport, I.W.

MELTON MOWBRAY.—August 19th.—For asphalting certain streets, for the urban district council.—Mr. E. Jeeves, surveyor.

STOCKPORT.—August 20th.—For making up a road, for the corporation.—Mr. J. Atkinson, borough surveyor.

SOWERBY BRIDGE.—August 22nd.—For supplying setts and making up certain streets, for the urban district council.—Mr. James Eastwood, surveyor.

HALIFAX.—August 24th.—For grouting with pitch or other approved material 30,000 super. yds. of granite macadam, for the corporation.—Mr. J. Lord, borough engineer.

EPSOM.—August 24th.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

BARNET.—August 24th.—For providing and laying tar-macadam, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor.

EASINGTON.—[illegible] for the [illegible] and paving [illegible] streets, for the rural district council.—Mr. G. Wardman, surveyor.

BEDDINGTON.—[illegible] for the supply of dressed kerb and channel, for the corporation.—Borough Surveyor.

SOUTHAMPTON.—September 7th.—For the execution of private street works, for the corporation.—Borough Engineer.

ITCHEN.—September 7th.—For executing works in certain roads, for the urban district council.—Mr. [illegible]

CLUTTON.—September 8th.—For [illegible] rolling and scarifying, for the rural district council.—Mr. J. S. Drury, clerk, Temple Cloud, Bristol.

Sanitary.

COWBRIDGE.—August 17th.—For the construction of sewerage [illegible] disposal works, for the rural district council.—Mr. G. S. Morgan, 23 Gelliwastad-road, Pontypridd.

HENDON.—August 17th.—For sewerage and other works, for the urban district council.—Mr. S. S. Grimley, engineer.

SALFORD.—August 17th.—For the construction of a sewer, for the rural district council.—Borough Engineer.

STAFFORD.—August 17th.—For work of sewerage, for the rural district council.—Mr. J. W. Cook, surveyor.

CHERTSEY.—August 18th.—For the construction of two circular bacterial filters, 80 ft. diameter, containing a total of 2,248 cub. yds. of destructor clinker; also small humus tank with pipes and appurtenances, for the rural district council.—Messrs. Elliott & Brown, Burton Buildings, Parliament-street, Nottingham.

REIGATE.—August 18th.—For the construction of surface-water sewers and manholes, for the corporation.—Mr. F. T. Clayton, borough surveyor.

FLEET.—August 20th.—For the construction of about 16 miles of stoneware and cast-iron sewers, brick, concrete, and cast-iron manholes, flushing tanks, ventilating shafts and columns, cast-iron rising mains, air mains, engines, compressors, ejectors, and other works incidental thereto, for the urban district council.—Mr. T. J. Moss-Flower, engineer, 28 Victoria-street, Westminster, S.W.

MARTLEY.—August 20th.—For the construction of 2¼ miles of 9-in. and 6-in. sewers, with manholes, lampholes, sedimentation tanks, bacterial filters, humus tank, sludge beds, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

OULTON.—August 20th.—For the removal of house refuse and cleansing cesspools, for the urban district council.—Mr. C. G. Taylor, clerk, Victoria Chambers, Lowestoft.

RUNCORN.—August 21st.—For the construction of sewers and sewage disposal works, for the rural district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire.

OGMORE.—August 21st.—For the construction of a culvert and sewers, for the urban district council.—Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.

SWANSEA.—August 29th.—For laying pipe for surface-water drainage, for the rural district council. Mr. G. Powell Thomas, surveyor, Station-road, Fforestfach.

TOTTINGTON (Lancs).—September 1st.—For the provision and laying of about 8,060 lin. yds. of cast-iron and stoneware pipe sewers, manholes, and storm-water chambers; also alterations to screening chamber, and tanks, and the construction of sedimentation tanks, percolating filters, humus tanks, sludge beds, channels, and diversion of stream course, for the urban district council.—Mr. L. Kenyon, engineer, Council Offices.

RHYMNEY VALLEY.—September 9th.—For the construction of main outfall sewer, about 10 miles long, for the Sewerage Board.—Messrs. Wilcox & Raikes, 9 Victoria-street, Westminster, and Mr. T. J. Thomas, 36 High-street, Bargoed, Glam.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

ROCHESTER.—[illegible] for the supply of tools, horse hire, forage, Portland cement, brooms, oils, paving materials, road metal, and coal, for the corporation.—Mr. William Banks, city surveyor.

Miscellaneous.

MIDDLETON.—August 18th.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. F. Entwistle, town clerk.

WOODFORD.—August 18th.—For the installation and maintenance of "Knight" street fire alarms, for the urban district council.—Mr. W. Farrington, [illegible] Offices, Woodford Green.

CHIPPING WYCOMBE.—August 24th.—For a two-cell refuse destructor, with water-tube boilers, for the corporation.—Mr. T. J. Rushbrooke, borough [illegible] and engineer, High Wycombe.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted

ARNOLD.—For making up a road, for the urban district council.—Mr. R. F. Clarke, surveyor.

A. & C. Rayner, West Bridgeford	£1,859
E. Somerfield, West Bridgeford	1,837
G. Beddows, Nottingham	1,812
A. Weaver & Sons, Arnold	1,765
J. Herrings & Sons, Limited, Arnold	1,736

CHINGFORD.—For making up roads of certain streets, for the urban district council.—Mr. J. P. Griffin, surveyor:—

E. J. Betts, Finsbury Park, N.	£1,352
T. Adams, Wood Green, N.	1,234
G. Porter, Clapton, N.E.	1,115
W. Myers & Co., Leyton	1,084
W. & C. French, Buckhurst Hill *	990

DURHAM.—For the construction of 185 lin. yds. of 15-in., 12-in., and 9-in. pipe sewers, manholes, ventilation columns, and street gullies, for the rural district council.—Mr. Geo. Clayton, surveyor.

B. Oliver, Gilesgate Moor	£157
J. Carrick, Durham *	153

GUILDFORD.—For the erection of twenty cottages, for the corporation:—

Dennett & Cooper, London	£5,374 (£48)
T. Sweetzer & Son, Guildford	5,250 (£20)
B. Speck, Guildford	5,200 (£88)
Tribe & Robinson, Guildford	5,130 (£95)
J. M. Rutter & Co., Guildford	5,060
W. Bullen & Son, Guildford	4,994 (£74)
B. Wood & Son, Guildford	4,825 (£55)
F. & H. Higgs, Cobham	4,781 (£80)
Crosby & Co., Limited, Farnham	4,690 (£65)
Stopald Brothers, Farnham	4,673
Reeves & Port, Rudgwick	4,646 (£60)
T. Higgs, Moore-street, Northampton *	4,419 (£52)

The figures in parentheses represent the amount to be deducted if Solignum be used.)

The above amounts include an item of £150 for contingencies.

HUNSLET.—For making up private streets, for the rural district council:—

J. Mannion, Leeds, £830.

MARLBOROUGH.—For laying 226 yds. of 6-in. cast-iron pipe sewer in the college grounds, for the corporation.—Mr. G. Parker Pearson, borough surveyor:—

W. T. Nicholls, Gloucester	£207
W. E. Free, Marlborough	190

ST. HELENS.—Accepted for granite paving work, for the corporation.—Mr. A. W. Bradley, borough engineer:—

J. Riddel, New Ferry.

ST. HELENS.—Accepted for making up certain streets and passages, for the corporation.—Mr. A. W. Bradley, borough engineer:—

J. Riddel, New Ferry.
R. Heaton & Son, St. Helens.

ST. HELENS.—Accepted for tar-macadamising a road, for the corporation.—Mr. A. W. Bradley, borough engineer:—

Ceiriog Granite Company, Limited, Chirk.

SALOP.—Accepted for the rebuilding of Ifton Heath council school, for the county council.—Mr. H. E. Wale, Shrewsbury.

H. Dorse, Cradley Heath, Staffs, £2,769.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

OCTOBER

9.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. AUGUST 21, 1914. No. 1,179.

Minutes of Proceedings.

New York Sewage Disposal Problem.

As stated by one of the experts who was consulted in the matter, this is "the largest and most complex sewage disposal problem which has yet required a solution." That this opinion is quite correct is demonstrated by the final report recently issued by the Metropolitan Sewerage Commission of New York. This enormous volume contains 760 pages of text, including numerous diagrams and tables, with, in addition, some twelve maps inserted, and even then many of the records of the work done by the commission have unavoidably been omitted. The commission has been engaged for eight years considering and investigating the most effective and feasible means of permanently improving and protecting the purity of the waters of New York bay and neighbouring waters. The final recommendations include the construction of intercepting sewers running approximately parallel to the water front to collect the sewage from the local sewerage systems and convey it to a number of centrally situated disposal plants, where the impurities are to be removed to such an extent that the effluent may be discharged into the waters without creating danger or nuisance. As an indication of the size of the works that would be required for dealing with the sewage, it should be noted that the population in 1910 was just over 4,500,000, but it is increasing so rapidly that it was considered desirable to provide for a population in 1940 of 9,000,000, and an estimated volume of 1,330 million gallons of sewage per twenty-four hours, which is equal to 148 gallons per head per day.

A large amount of the information contained in this report is naturally of purely local interest, but there is also much that should be of great service to municipal and other engineers in all parts of the world, who are under a debt of obligation to the members of the New York Commission for the admirable manner in which the results of their investigations have been made available for the use of their brother engineers in other countries. In the first place, we may note the basis upon which the Commission and its staff were organised, and particularly the appointment as president of the commission of a technical man capable of personally directing the scientific and technical work of the large staff of trained engineers, chemists, and bacteriologists. Secondly, the commission have taken advantage of the experience gained by others engaged in this branch of work by inviting twenty of the best qualified experts, including four from this country, to assist them by criticism, both constructive and destructive, of their proposals. Among these experts were engineers, chemists, biologists, medical officers, and even a professor of statistics, and their reports, which are published in full, are worthy of very careful study. Another praiseworthy feature is the promptitude with which the final report has been issued. The commission completed its work at the end of April last, and in less than three months their final report was printed and issued, not only to all concerned, but available even in this country. In addition to this, the commissioners immediately resigned and left the position clear for the appointment of the permanent commission they recommended for the purpose of carrying out their proposals. Another feature of interest is the boldness with which the problems of construction were attacked. This is apparent from a study of the drawings attached to the report, which set forth the design of enormous sewers up to 14 ft. diameter, carried in some places at great depths under hills, in other places, in the form of inverted syphons, under large rivers, and even out into the sea, and finally by the novel proposal to build an island of about 50 acres in area, situated in the sea about 3½ miles out from the shore, for disposal works.

With regard to the methods of treatment to be adopted for the disposal of the sewage, these vary according to the degree of purification necessary to meet the different conditions at the separate outfalls. In all cases grit chambers will be provided on the main trunk sewers at or near the disposal works, and these will have a settling period of from one to two minutes in order that the velocity may be reduced sufficiently to allow heavy mineral matters to be deposited without arresting much organic matter. In such cases fine screens alone, in other cases coarse screens followed by sedimentation, are recommended, the screenings and sludge being disposed of by some of the at present known methods, whichever happens to be most suitable for the local conditions. It is important to note that, in all cases, the outfalls for the clarified sewage are to be arranged to terminate at some distance from the shore, and always at depths of from 30 ft. to 50 ft., and, in order to facilitate thorough diffusion with the water, the sewage will be discharged through several openings at each outfall. Finally, it is anticipated that the whole of the impurities which remain in the sewage after the preliminary treatment outlined above will be satisfactorily oxidised by dilution in the waters of the harbour without creating a nuisance. The question as to the amount of dissolved oxygen which must be maintained in the water in order to prevent the production of gases which would cause a nuisance was thoroughly investigated and discussed, and in this connection the report affords a mine of information for those who may have similar problems to solve. It appears that the commission originally proposed to recommend a restriction that the average dissolved oxygen con-

[illegible] of the harbour water should not be allowed to fall below [illegible] per cent of saturation. Eventually, however, they showed that it would not be necessary to make this restriction, for the reason that if the other requirements are complied with there will be sufficient oxygen in the water for the purpose. In the opinion of some of the experts consulted, it would be impracticable to maintain a [illegible] standard for all parts of the harbour water; while others believe that a much [illegible] would be sufficient to prevent any nuisance arising when the [illegible] matter and sludge are prevented from entering the harbour. So far as river [illegible] our own Royal Commission on Sewage Disposal expressed the opinion that it would be desirable to maintain not less than 60 per cent of saturation in order to prevent nuisance arising, and this agrees closely with the standard originally proposed by the Metropolitan Sewerage Commission for the waters of New York Harbour.

* * *

Municipal Motors.

The use of motor vehicles for municipal purposes is a question which has been exercising the minds of many of the larger local authorities of late, and consequently any reliable information as regards the efficiency of a motor service as applied to such matters as the removal of house refuse and street cleansing and watering cannot fail to be of interest. On a recent occasion the Holborn Borough Council appointed a special sub-committee to inquire into this matter, and Mr. E. F. Spurrell, the borough surveyor, has prepared a most valuable report, in which he discusses the possibility of improving the systems at present in force in the borough in the light of modern methods and experience. In many parts of London the municipal motor is already a familiar sight. For example, the City Corporation owns six motor vehicles, which are used for the collection of refuse and street watering. Then, again, Chelsea has no fewer than sixteen such vehicles at present in use for similar purposes, while Westminster possesses seventeen. The general conclusion drawn by Mr. Spurrell from his investigations in these and other districts is that the steam wagon on steel tyres is cheaper to run on municipal work than the petrol motor on rubber tyres. It is no doubt true that the former type of vehicle is open to objection on the score of its greater noise and vibration, but this disadvantage is not so great as might appear at first sight, owing to the fact that a wagon engaged in municipal work, and in travels at a speed of more than about 5 miles an hour.

The main question, however, is one of finance. In what circumstances and under what conditions can municipal work be carried out by means of motor vehicles at a cost less than or at all events as small as that which would be incurred by the use of team labour? To this question Mr. Spurrell makes the general reply that a motor van is intended to move, and that it pays while it is travelling, but not when it is crawling from door to door. It follows that for such work as watering, flushing, and sweeping the motor is invaluable, but the collection of house refuse presents an entirely different problem, and in this department motor traction has not shown such good results. The report under consideration attributes this fact to want of system, and suggests a novel plan by the adoption of which the application of the motor to this work would become economically possible. The plan is for half-a-dozen men to precede the motor van, so that the portable bins are in the street ready to be tipped into the van when it arrives. There is no reason why a motor van should not proceed slowly through a street, the contents of the various small portable bins being thrown into it while it is on the move, and proceed to the shoot when loaded, carrying considerably more refuse, and at a quarter of the time occupied by a horse-drawn vehicle. Moreover, this system would prevent the sorting over of the refuse by the dustman at the van's side, as is now a common practice.

Mr. Spurrell's report concludes with a table showing the comparative cost of using motor appliances in the borough, and the present cost of horse transport. From this it appears that for dusting and slopping, day watering, night flushing and gully cleansing the actual cost would be slightly greater, although the increased expense would no doubt be accompanied by an even greater increase in the efficiency of the services named. The cost of mechanical sweeping, on the other hand, would actually be reduced by the adoption of the motor appliance. The report is one for the publication of which many municipal engineers will be grateful.

* * *

Road Widening and Sanitation in Bombay.

Like Shakespeare's heroine, the Bombay Municipality has a divided duty to discharge in which respect it has a strong resemblance to other municipalities—judging by the fact that the claims of road making and the claims of sanitation have their special advocates among the members. The Improvement Trust of Bombay has authority conferred upon it with respect to the construction of new roads, and criticism at a late meeting was directed against its policy of acquiring "set-backs" for the widening of streets at a high cost, of making up the roads in a more or less unsatisfactory manner—it was categorically stated that in several instances main roads were not sufficiently strong as regards foundations to bear the volume of traffic—and subsequently handing them over to the municipality in this condition for future maintenance. A suggestion having been made that a concrete bottoming should be provided, it was humorously retorted that this was precisely the quality in which Improvement Trust was notoriously wanting, as to which our own knowledge is professedly deficient. The defence set up by the Commissioner was that the increased expenditure on roads brought the municipality a correspondingly increased revenue. This was the case with new roads, at all events, but it was admitted that as regards old roads that had been widened the financial benefit was not so apparent. The fact is, of course, that Bombay, like other towns no longer in their first youth, has to pay substantial sums for the purchase of property for the purpose of widening its old, narrow thoroughfares, but the idea that this necessarily entails financial loss cannot be entertained seriously for a moment. Given a capacity to bear the burden, a municipality can hardly undertake a more desirable responsibility, alike from the point of view of sanitation or commercial success, than the improvement of its streets. The period for the repayment of the loans for road improvement forms a grievance with municipalities in India, as it frequently is in this country. The Bombay Municipality succeeded in raising one of its last loans for a period of forty years, and it is hoped that this term may be extended in future. But whether this prospect will bring solace or satisfaction to that section of the municipality that believes that sanitation is being neglected while road improvement is flourishing is indeed very doubtful. One feature, alike interesting and full of promise, emerges from the proceedings as we read them in the *Times of India*—viz., the native members of the corporation would appear to be zealous and even enthusiastic in their wish to see still larger sums spent upon the general sanitation of the city and upon improving certain areas in particular that doubtless stand in need of regeneration and reform.

Wiltshire Main Roads.

At the last meeting of the Wiltshire County Council an entirely unjustifiable attack was made upon the district surveyors responsible for the maintenance of the main roads of the county. The occasion was a recommendation on the part of the county surveyor that the county council should themselves undertake the main tenance and supervision of the wheel of the main roads at present repaired under contract by the rural district councils. We have no desire to criticise the recommendation of the county surveyor, even if we were in a position to do so; although it appears from a circular letter signed by nine of the district surveyors and addressed to the chairman and members of the county council that the main roads in question have been maintained by the district councils or their predecessors since the abolition of the turnpikes, and it is contended that the work has been performed both economically and satisfactorily. What we do complain of, however, is the tone of the speech in which Mr. Docking, a member of the county council, attempted to raise the question. To begin with, he was desirous of having the matter discussed before the members of the council had had an opportunity of perusing the report of the county surveyor. Then instead of debating the matter as one of policy, he proceeded to make an attack upon the thirteen district surveyors *en bloc*, alleging that the county surveyor had been complaining for a long time past that the supervision of the roads was entirely inadequate, and that there was no one to see that the men were earning the wages which they were paid. It is a little difficult to understand this statement in the light of the county surveyor's report for the year ending March, 31, 1913, in which he says that, taking his last annual report as a basis, "there is a steady improvement in the condition of the roads in the contract districts." Some idea as to the real facts may be gathered from the letter from "One of the Ten," which appears in another column. Moreover, if Mr. Docking's statements are correct, it has always been open to the county council to give any defaulting district council notice, under sec. 11 (8) of the Local Government Act, 1888, to put the roads in repair, and if this notice was not complied with to do the work themselves and charge the district council with the cost.

* * *

Security of Tenure.

Writing in the *Empire Review* on "Civil Servants and Security of Tenure," Sir Charles Bruce lays down certain principles which we venture to think are equally applicable to the case of the municipal officer. He says: "Security of tenure depends on the recognition of two rights—the right to a definite statement of any charges made a ground of accusation, in order that an officer may have a full opportunity of reply and defence, and the right to an inquiry by an independent and impartial court or tribunal." Again, he points out that it would be a grave error to suppose that the question of security of tenure is limited in its consequences to the personal interests of the individual officers concerned. Security of tenure is the only safeguard of liberty of opinion, and liberty of opinion the only bulwark against the tyranny of bureaucracy. It would be difficult to find other words in which to put the whole case at once so concisely and so clearly. Our own views on this question are well known and need not be repeated here. Sir Charles Bruce's propositions exactly fit the case of the municipal engineer whose professional duties bring him into personal antagonism with a member of his authority. If he had security of tenure, he would also possess liberty of opinion, "the only bulwark against the tyranny of bureaucracy." Further, in the event of an active manifestation of such tyranny, he would have recourse to an independent tribunal, instead of being compelled, as at present, to accept as final the decision of a body of which his opponent is a member and he himself an officer. It is, of course, impossible for us to discuss the merits of the particular case in the Civil Service with reference to which Sir Charles Bruce writes. We can only say that if municipal engineers only enjoyed the same security as the established civil servant at present has, they would consider themselves much more fortunately situated than is now the case.

* * *

The Microscopy of Drinking Water.

"The Microscopy of Drinking Water," by Mr. George Chandler Whipple,* is a book of a more practical character than its title suggests, and one which contains much that is of vital importance to those engineers who have to deal with storage reservoirs and their waters. In the preface the author states that the work is elementary in character. It is certainly a book which any water engineer might read with advantage, with the strong probability that he would forthwith buy a microscope and thenceforth develop a new interest in life—namely, that of discovering in the waters, reservoirs, water mains and tanks with which he has to deal some of the causes of his troubles in the shape of the organisms described by Mr. Whipple, and shown so clearly in the excellent illustrations and coloured plates contained in the volume. That these organisms are the direct or indirect causes of various troubles—such as bad odours in water, colour, coating of mains, and other effects—is abundantly clear, and Mr. Whipple's collection of facts and instances form a most valuable work of reference. In particular, the section dealing with the stripping of the soil on the sites of reservoirs, with its record of results, will be of interest to all those who are concerned with the construction of storage or impounding reservoirs. The instances of the removal of odours from waters by means of filtration are also extremely interesting. The author appears to hold the opinion that it is more economical to treat the water after storage than to rely upon the entire removal of vegetable matter from the site before filling a storage reservoir.

* * *

The Road Board's New Appointment.

We offer our hearty congratulations to Mr. H. P. Maybury, M.INST.C.E., and to the authority he serves, on his appointment as manager as well as engineer to the Road Board. The appointment is significant, as it is evident that in his position as manager, Mr. Maybury will have to deal with the re-organisation of the department, under the capable control of the chairman of the board, Sir George Gibb. It has often been suggested in the past that in some ways the board was not quite in touch with local authorities and their officials, but with Mr. Maybury as manager it is evident that this little difficulty will soon be adjusted. Mr. Maybury has the great advantage of having been at one time the surveyor of an important town, and subsequently the county surveyor of Kent, so that he is thoroughly acquainted with the procedure and requirements of municipal and county undertakings. His practical knowledge also of road construction and maintenance will be invaluable to the board in the distribution of their grants and loans. It was a happy inspiration that prompted the board to make this appointment, and we shall no doubt very soon see the beneficial results which are bound to follow under this new management.

* Third edition, rewritten and enlarged. Chapman & Hall 17s. nett.

Road Improvement in the North of Ireland.

By [illegible], County Surveyor, Tyrone (South).

It will be generally admitted that in recent times the politicians of the United Kingdom have taken a rather prominent part in the political world, and it is therefore not to be wondered at if its inhabitants have not been giving much consideration to the question of road maintenance.

It may not, therefore, be considered altogether unprofitable and uninteresting if I endeavour to focus attention on a problem which must very shortly come to be recognised as of pressing importance to this community.

In order that I may be understood by those who are not familiar with our system of local government as applied to road maintenance, I must explain that in Ireland all rural roads are under the direct control of the district councils, with whom all and every expenditure must originate. The county councils cannot originate any road maintenance expenditure, though they may, and do, provide the necessary plant for the purpose. The executive officer, under whose supervision all work is carried out, is the county surveyor. There are no independent district surveyors in the sense in which they are known in Greater Britain, but the district councils have no direct control over the county surveyor or his staff of assistants. The maximum annual sum which any district council can apply to road maintenance—known as the "Limit of Expenditure"—is fixed by law. Traditionally, from time immemorial, all road work has been done by contract—men undertaking to maintain a length of road in proper order at so much per local perch—and until comparatively recently any other way of getting work done was illegal.

It will be easily understood that anything like continuity of policy, even among the various districts in the same county, is difficult of attainment, while as between adjoining counties, it is unknown. Prior to the year 1899, when the present system of local government superseded the Grand Jury system, it was almost without exception the case that the traffic was relied upon to make the roads. County surveyors, as a body, had long before recognised the absurdity of this arrangement; nevertheless, it was some years before they were able to convince the district councils that it was their duty to reverse the process and make the roads for the traffic. So far as the nine counties of Ulster are concerned, this elementary principle is now generally recognised.

Naturally, the first step in carrying out the new policy was the introduction of steam rollers, machine stonebreakers, and so forth, and for a time everybody was satisfied with the rapid improvement of road surfaces. Had the traffic problem remained as it was, all would have been well. The coming of the motor, and more especially the introduction of the commercial motor, which has been extraordinarily rapid in the North-east of Ireland, has entirely altered the conditions with which the district councils have to deal, and the methods of maintenance must inevitably be altered, if the roads are to continue to carry the traffic.

The problems which confront the Northern county surveyors at the present time are: (1) How to meet the universal demand for roads strong enough to carry the new traffic, and smooth enough to carry it with comfort to the users, without (2) at the same time exceeding the statutory "Limit of Expenditure."

As regards the first, the "Man in the Street" will probably say "Surely this same difficulty has been experienced and solved long since in Greater Britain! Why not adopt the same methods which have proved efficacious across the water. Tar treatment is bound to put an end to all complaints!" Many of our district councillors, and the whole motoring public, have seen and heard of the wonderful results of tar treatment—I use the term in its widest sense—and not unnaturally they have jumped to the conclusion that all that was wanted was to go in for that treatment and the trouble would be over. Unfortunately, we county surveyors find that the problem is not going to allow itself to be settled in this off-hand fashion. It is admitted that, given the best material in sufficient quantity, the failure of so-called "water-bound" macadam roads under normal traffic, is largely due to the penetration of water into the foundations and its lodgment there, and in the crust itself. To combat these two distinct sources of weakness the crust may be made impervious and an efficient system of subsoil drains provided, but it has been found that any attempt to waterproof the surface while the subsoil remains waterlogged inevitably results in failure, and is sheer waste of money. Nor can anyone familiar with the North of Ireland fail to have observed that, as a general rule, the level of the subsoil water—as shown by the state of the side drains—cannot at most be more than a few inches below the level of the road surface itself; or, in other words, the foundations are waterlogged.

The most ardent advocates of tar cannot but admit that, so far as the rural roads in the North of Ireland are concerned, the treatment has been anything but a success, and undoubtedly the chief cause for this has been the almost entire absence of artificial subsoil drainage. There are at least two other causes for this want of success, and in regard to these it is difficult to see how they are ever to be disposed of. While our total rainfall is not greater than in many other parts of the United Kingdom, the number of days upon which some rain falls is very great. The result of this is great interference with the work of manufacture and laying, and a consequent increase in cost, beyond all reason. Again, during the winter and early spring there are a great many nights during which there is a slight "hoar" frost—probably three or four every week. The slightest frost of this kind makes any tarred surface so slippery that it is quite impassable for farmers' horses next day until the sun is well up, and it is too late for the day's market.

My own observation and experience would go to show that it is open to very grave doubt whether or not "tar" treatment will ever solve the resurfacing problem in the North of Ireland. The probability is that a binder which will give a somewhat rough surface, and which can be prepared and laid down irrespective of climatic conditions (except frost or snow), is much more likely to meet our requirements. One thing is clear—before we can hope that tar treatment will really lengthen the life of the road crust to such an extent as to justify the additional cost very considerable sums of money must be devoted to improved drainage. In this connection it is rather unfortunate that the Road Board policy in Ulster has, for so far, been to look with a more friendly eye on projects for tar treatment than on those for improved drainage.

Turning now to the second phase of the problem—the question of finance—we find ourselves in a most difficult position. As has already been mentioned, the maximum total annual expenditure of each district council is fixed, and cannot be exceeded without the consent of the Local Government Board. This, however, is easily enough

obtained, if a council wishes it; but, unfortunately, the fact that an increase in the "Limit of Expenditure" involves a corresponding increase in the rates is sufficient to make most councils hesitate about "asking for more." Accordingly, this solution can only be applied as a last resource. The ardent motor owner, who has just paid his annual tax (with the feeling which we all know of having got but poor value for our money), gravely asserts that all the money paid to the county council by motor car owners cannot fail to be of substantial assistance. Nothing could be further from the reality. Each county council only gets a refund of 5 per cent of the money collected on cars registered in it, and gets this money in such a way that not one penny of it can be directly applied to road maintenance or improvement. Were it paid to the district councils, to swell the "Limit of Expenditure," even the 5 per cent would be of some assistance, but as it is the money is simply swallowed up in the common fund.

It is only through the Road Board grants that any of the money contributed by motorists under the Finance Act, 1910, can become a help, and these grants have, for so far, a way of turning out disappointingly uncertain.

The amateur lawyer suggests that immediate proceedings should be taken under the Public Roads (Ireland) Act of 1911 for the recovery of damages done by all commercial motors. That there are circumstances under which resort to this Act is justified I am prepared to admit; but, on the other hand, when the facilities which a service of motors must undoubtedly give to the whole community are taken into consideration, a council which availed itself of such legal proceedings in every case could only be regarded as short-sighted and retrograde in the extreme. On the other hand, it is notorious that the proprietors of such vehicles are not running them from purely philanthropic motives, and they might very reasonably be expected to pay a tax on the same scale as is applied to motor cars. As the law stands, these vehicles are exempt from taxation—a state of affairs which is surely anomalous.

There is, however, one way by which the financial stringency would, to a certain extent, be eased for some years to come. I refer to the adoption of carefully thought-out schemes of "direct labour," embracing all the important roads, thereby setting free the money which now goes as clear profit into the pockets of a road contractor, and making it available for road work. Up to the present only three Ulster counties have "direct labour," schemes in operation, and recognised by the Local Government Board as such.

It is extraordinary how strongly a North of Ireland district councillor is opposed to "direct labour" in his public capacity; in his own personal business the man realises its advantages to the full. The explanation is, I think, to be found in a deep-seated belief that money paid to an official is money wasted.

Unquestionably the success of any direct labour system depends entirely on efficient supervision, which can only be obtained by the appointment of an additional staff. At any rate, it is a fact that direct labour has spread much more rapidly in the south and west than in the north, and that is not a thing of which Ulstermen should be proud.

I have drawn attention to the questions which are exercising the minds of the northern county surveyor, and have tried to show why, in my opinion, it is quite possible that the most satisfactory surface for North of Ireland roads may not be found along the lines now recognised by the majority of English road authorities. This possibility enables me to draw attention to a difficulty which has made itself felt by every enterprising county surveyor in Ireland. I refer to the impossibility of obtaining funds for undertaking experimental work. Under the existing law, the application of the rates in such a way is quite illegal. Of course, by means of certain roundabout and casuistic reasoning, some trifling work of the kind may be indulged in (I have done it myself), but there is no chance of following an experiment through to a practical conclusion. It is to be hoped that in the near future the Irish Local Government Board will be granted the power to relax its rules as to what may be regarded as legitimate expenditure by county councils. A series of experiments and observations on similar lines to those at present in progress in Scotland financed by the county councils, and carried out with the co-operation of the Road Board, could not fail to be of the greatest scientific and practical value.

NOTES ON TAR-MACADAM WORK.

By "Cretaceous."

Distilled tar should be used in order to procure a first-class material, especially where it is necessary to lay the tar-macadam a few days after the mixing.

In cases where the material can be allowed to mature for a period of about eight or nine weeks, gasworks tar will give excellent results. Exposure to the air causes the light oils, &c., to evaporate; consequently, the setting properties of the macadam are vastly improved.

If it should be necessary to lay the material a few days after the mixing, a small proportion of lime added to the tar and stone during mixing will improve its setting properties. The lime generates heat, and therefore tends to drive off light oils, &c.

Roads in country districts are generally some considerable distance from railway stations, and it frequently happens that the material cannot be carted at a rate sufficient to enable the rollers to work full time. In these cases it is necessary to clump the tar-macadam on the roadsides so that it can be barrowed and spread when sufficient material has been accumulated to keep the rollers and gangs working at a reasonable pressure. Large clumps should be made, and the material in them kept as high as possible. Before commencing to remove the material, it is advisable to spray a small quantity of hot tar over the side of the clump next to the passing traffic.

The objection to small clumps is mainly due to dust raised by motor traffic adhering to the tar, and the amount of earthy material which would be shovelled up with the lower layers of the heaps.

Should it be necessary to scarify a surface prior to treating it with tar-macadam, the disturbed crust should be tightly steam-rolled before the new material is applied.

It has been found an advantage to water the old surface during hot weather before spreading the tar-macadam. Paradoxically, it is not advisable to sprinkle water on the roller wheels; a better job can be made by keeping them clear of tarry material by constant brushing with hard brooms.

The finished coating should be tar-painted and dusted with slag dust as soon as the material has worked to a smooth surface under the action of traffic. Under ordinary heavy traffic the tar should be lightly applied fourteen days after the completion of the rolling work.

It has been the practice to tar-paint tarred macadam every other year. The life of the material can be much prolonged by lightly painting soon after rolling, and every subsequent year.

Applied Geology in Municipal Engineering.—In the course of the discussion of Dr. Lapworth's paper on this subject at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham, Mr. S. S. Platt, borough surveyor of Rochdale, mentioned that in all his works he insisted upon all his assistants recording information as to the strata passed through in all trenches and excavations, and that the information obtained was exceedingly valuable, and would be useful in the future, especially in places where the ground changed very rapidly and the changes could not be foreseen. We find that in our report on p. 223 of last week's issue the word "especially" appeared as "except"—an error for which we express our regret to the speaker.

PONT EBBW BRIDGE.

BUILT FOR THE MONMOUTHSHIRE COUNTY COUNCIL.

By William Tanner, F.S.I.,
County Surveyor.*

Situated about 2½ miles from Newport, on the road and railway from that town and the city of Cardiff, the new Monmouthshire ferro-concrete bridge described in the article carries the river Ebbw, a tributary of the river Usk, flowing through Tredegar Park, the Monmouthshire seat of Lord Tredegar, well known as one of the few remaining survivors of the Balaclava Charge. The old bridge, of which a photographic view is given in Fig. 1, was inconveniently narrow, and situated at an awkward angle. Moreover, the road had an undesirable twist on either side of the bridge. Consequently, when it became necessary to remodel the structure, it was decided to provide for a considerably increased width, and also for a much-needed highway improvement with the object of abolishing the bends on either side of the river.

Figs. 1 and 2. The Old and New Pont Ebbw Bridges.

Fig. 2 is a view of the new bridge, and Fig. 3 a site plan where the position of the old bridge and the line of the road are indicated by broken lines, the new bridge and the remodelled road being shown in continuous lines. Inspection of this plan will enable the reader to see at a glance the greatly improved traffic facilities afforded by the reconstruction works, and the rearrangement of the approaches from Newport and Cardiff respectively.

Fig. 4 is from a photograph making clear the main features of the design, and Fig. 5 includes drawings showing the construction of the new bridge. The new portions of the three arches are carried by ordinary concrete abutments and river piers, the latter including the old masonry piers, as indicated in the half-transversal section and half plan.

All three arches are of the monolithic type, entirely fixed at the springings and enclosing the old brick arches. The new portions vary in width up to 20 ft., and are about 10 ft. 6 in. wide at the middle of the span. They are 12 in. thick at the springings, and 6 in. thick at the crown. Earth filling is deposited over the arches for the support of the road foundation, the arrangement of the roadway and footpaths being represented in Fig. 5. The spandrel walls and parapets are in ferro-concrete, and although the design is exceedingly simple, the general effect is of distinctly pleasing character, and the remodelled bridge harmonises very well with its surroundings.

The work was designed by the writer and his assistant, Mr. S. A. Barnett, the contractors being Messrs. E. Evans & Son, Limited, of Cardiff.

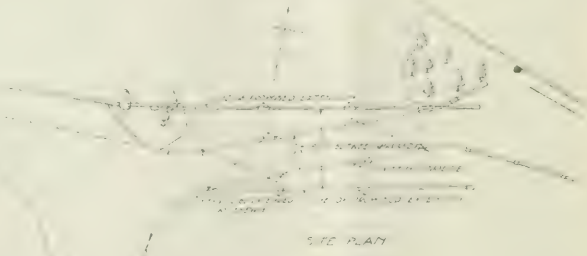

Fig. 3.—Pont Ebbw Bridge.

* Mr. Tanner's article is reproduced from the August number of *Ferro-Concrete*, by kind permission of the proprietors.

ROAD BOARD.

MR. MAYBURY'S NEW POST.

We understand that the Road Board have made some changes in the organisation of their staff, and Mr. H. P. Maybury, who became chief engineer to the board in November last, has been appointed to a new post with the title of "manager and engineer."

Bristol Tramways to be Municipalised.—The Bristol Corporation Tramways Act, authorising the corporation to purchase the undertaking of the local tramway company, has received the Royal Assent.

Improved Tar-spraying in Bombay.—The *Times of India* of June 9th reported that the new tar-sprayer purchased by the Bombay Corporation had been working on the city streets. The work upon which the machine was engaged was an experiment so far as Bombay is concerned, but should it prove successful it is understood that the corporation will purchase additional machines, and employ them freely on the main roads.

"Good Road Days."—Monday and Tuesday last were "good road days" in Missouri, and, armed with a pick and shovel, Governor Major led the men of the State in the betterment of the highways. The workers give their services free. Last year, when Governor Major inaugurated the scheme, 250,000 men responded to the call, and in the two days gave work and material estimated to have saved the State $1,500,000. Even greater results are expected this year. The results proved so popular that many other States followed suit, and more will imitate this year. Thousands of Missouri housewives prepared free lunches for the workers.

SUMMER SCHOOL OF TOWN PLANNING.

COURSE AT UNIVERSITY COLLEGE.

The University of London has inaugurated the study of town planning by holding a summer school at the new School of Architecture at University College. The newly appointed professor of town planning, Mr. S. D. Adshead, M.A., F.R.I.B.A., is giving a short series of lectures, and, in addition, all the best-known authorities on the subject are contributing to the course. The lecturers include Mr. Raymond Unwin (The Practice of Town Planning), Mr. Patrick Abercrombie (Town Planning in the Past and Abroad), Mr. Edmund R. Abbott (Legal Aspects of the Subject), Mr. G. L. Pepler (Engineering and Surveying Problems), Mr. H. V. Lanchester (Tradition and City Development), Mr. Thos. H. Mawson (Public Parks and Gardens), and Mr. John Nolen (Town Planning in America).

FIG. 4. PONT EBEW BRIDGE.

The shadow of the war has hung heavily over the course, and a number of visitors from America and the Continent were obliged to withdraw at the last moment. Dr. Brauchmann, Professor at Carlsruhe, who was to lecture on German town planning, was unable to attend, and several of the students who are members of the Territorial Force were called up on the second or third day of the session. About forty members have still been able to follow the course throughout however.

At a reception held at University College, the members and friends were received by the provost of the college (Dr. T. Gregory Foster), Mr. Raymond Unwin (chairman of committee), Mr. Herbert Samuel, president of the Summer School, being unfortunately prevented from attending by the European crisis. In his absence the address was delivered by Mr. Raymond Unwin.

Town planning, said Mr. Unwin, was one of the last arts to be learned and practised by civilised peoples. They little thought when they planned that gathering that it would be held at the beginning of an upheaval which might bring European civilisation down in ruins, and could hardly fail to affect its development profoundly. It seemed that, after so much progress, the peoples of the world were still full of helplessness, as though the organisation of life had not kept pace with the overwhelming growth and complication of mere material development. The nations seemed overwhelmed by a complexity they had not learned to control. But there was a distinction between the nation as a whole and the people of which it was made up. Many of them have friends in other countries, and had been hopeful of a combination of effort between the peoples of different parts of Europe in the service of a joint forwarding of social and civic amenities, and they could not help being saddened by this abrupt downfall of their hopes.

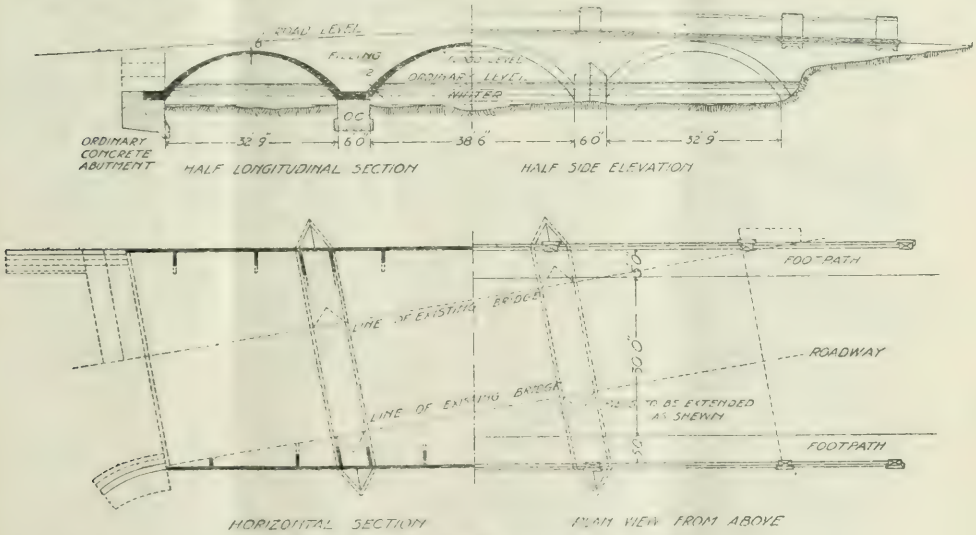

FIG. 5. PONT EBEW BRIDGE. STRUCTURAL DETAILS.

Mr. Unwin spoke of the growth of town planning as a subject of university teaching, especially with reference to the recent appointment of Prof. Adshead as Professor of Town Planning in the University of

[illegible] The summer school now being held in the university was started ten years ago at Hampstead under [illegible] suggestion of Mr. J. S. Rith[illegible] [illegible] from the beginning [illegible] secretary, and being the mainspring of the organising work. The university, in securing the services of Mr. Adshead as Professor of Town Planning, had been fortunate in having the advantage of Prof. Adshead's experience in organising the first school of town planning at Liverpool. Prof. Adshead brought to his new duties a [illegible] training and an [illegible] [illegible] He had had the honour of being appointed [illegible] King to [illegible] and [illegible] the Prince of Wales journey in South London, and added to his [illegible] [illegible] the charm of an [illegible] personality.

The [illegible] of social life which town planning [illegible] and Mr. Unwin, the power of [illegible] and the pleasures of associated life. The [illegible] of modern civilised life was not, perhaps, a gain to the planner of towns, who ought rather to lift himself above the multifariousness of to-day, and see if it was not possible to build cities which should express a more wholesome simplicity of human relationship. Mr. Unwin gave an eloquent and vivid picture of the more primitive conditions of life in ancient Athens, in which, although the majority of men were no better off than our agricultural labourers, a [illegible] of perfection in art was reached which has never been surpassed in these later days. A similar contrast was drawn by Mr. Unwin in Rothenburg, an old walled town in which the population has never exceeded more than 9,000, which has always been dependent upon the common life of its farmer population for its art and development, and which stood to-day as a model of a town perfectly adapted to its needs, and clothed in all the dignity and simplicity of a native art.

Dr. George Fowler, Principal of University College, welcomed the members to the new buildings of the School of Architecture, and stated that with the [illegible] courses in town planning and [illegible] engineering would be established.

A telegram from the President of the Local Government Board, in which good wishes for the success of the school and of the town planning movement were expressed, was read.

Mr. Thos. H. Mawson, in the course of a lecture on "Parks and Gardens," said that, at the present time, when every mind was obsessed with the war, and hardships must fall on the working classes of this country, the subject of his lecture was most opportune. Of the different classes of work for the relief of distress none could compare with the construction of public parks and gardens. Such work seemed to come naturally to every Britisher, who was by nature a [illegible] lover, and lessons of this fact was always prepared to give in return adequate recompense and [illegible] any wages he might receive.

Sewage Outfall Screens.—Mr. Sidney Palmer, borough surveyor, St. Ives, Cornwall, writes: "I should like to ask a question through THE SURVEYOR of surveyors to other seaside resorts, if I may: My council have instructed me to fix some sort of cage on the mouth of the sewage outfall for the purpose of catching papers, &c., which in certain tides get [illegible] the beach. Has such a contrivance been used elsewhere? If so, I should esteem it a favour if any of your readers would give me any information that would be helpful."

Truro City Water Supply. We have [illegible] with a view to improving the filtration of the water supply of the city of Truro, and of bringing the works into line with the most modern system of supply, it has been decided to substitute Candy mechanical filters for the present open sand filters. At the seventy-second half-yearly meeting of the Truro Water Company, held on the 1st inst., the directors reported that the further installation of Candy filters would soon be in operation, and that the cost of working the new filters would be considerably less than the expenses attendant on the sand beds, while the capital cost of the Candy filters is much below the heavy expenditure that would have been incurred by the construction of the area of additional sand beds necessary for giving an adequate supply of properly filtered water. The cost of the new Candy mechanical-pressure filters, about £1,400, will be paid out of the balance of profit after the 6 per cent dividend is paid, and there will then be a balance of £2,049 carried forward.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

In view of almost wholesale unemployment and general distress, is it not possible to arrange in some way for a conference of surveyors to consider the best means of dealing with it? Although by this time every surveyor is, no doubt, well prepared with schemes for employing the unemployed, would it not be of great importance if there could be some such meeting each of local centres, at which each surveyor might be able to say what he intended to do, and thus assist those who were not so well prepared with schemes?

* * * *

Failing such a conference, could not surveyors throughout the country send a short statement of their suggestions for insertion in the columns of THE SURVEYOR, and thus secure the publicity which is needed?

* * * *

Is it not a fact that hitherto there has always been found great difficulty in times of distress to suggest really useful improvements which could be carried out by the class of men who swell the ranks of the unemployed? Should not everyone in a position to do so assist at this juncture with suggestions as to municipal works that would be useful?

* * * *

Is it a fact that the Road Board have commandeered all the bituminous materials that they can find in this country so as to prevent the prices going to a prohibitive figure, and thus interfering with the road work which the board hope will be duly put in hand to allay the labour distress which may eventually have to be considered?

* * * *

In connection with this inevitable distress, can nothing be done to stop the foolish and even criminal drinking which is proceeding at an excessive rate in most of the public houses throughout the country and especially in London? Cannot these foolish people realise that the money they are now squandering in drink will be sorely needed when the pinch of unemployment comes?

* * * *

Would it not be possible to obtain an "honours" list of all those surveyors who at this crisis in the world's history are taking an active part in the defence of their country? Could not their names, and the names of their assistants be ascertained and published in the columns of this paper and in the *Journal* of the Institution of Municipal and County Engineers?

* * * *

How many people are there who realise the importance of the great health movement that has been going on in this country during the last twenty years? Are they aware that in the past twelve years the annual death-rate throughout the country has been reduced from 16·9 to 13·3 per 1,000; that the deaths from typhoid fever have gone down by more than one-half; and that those from "consumption" have declined by 14 per cent? Should not the surveyors and medical officers of this country be proud of their share in the good work that has been accomplished?

* * * *

How many surveyors have read the excellent course of lectures on "Army Sanitation" by Lieut.-Col. C. H. Melville, M.B., published in the *Journal* of the Royal Sanitary Institute, vol. xxxii., commencing on p. 169? Would they be surprised to hear that these lectures contain an immense amount of practical suggestions for the wellbeing of troops on the march and in camp, and that their study at the present juncture would be of inestimable value to the surveyor who is anxious to give assistance to the War Office?

Business as Usual.—Messrs. L. G. Mouchel & Partners, Limited, the concessionaires in this country for the Hennebique system of ferro-concrete construction, wish to refute any rumours to the effect that, owing to the large number of men who have left their employment for the seat of war, both French and English, their business is disorganised. Although twenty-five of their employees have joined the colours, they still have an efficient staff numbering fifty, and will use their utmost endeavours to maintain the business of the country, and to ensure the continued employment of the thousands of workmen engaged upon the various contracts with which they are connected.

The Sampling of Sewage and Other Liquids.*

By G. BERTRAM KERSHAW, M.Am.Soc.C.E., F.G.S., F.R.M.Ets., F.I.S.E.

A very usual object for which samples of sewage and various other liquids are taken is to ascertain the chemical or bacterial quality of the liquid sampled, and thereby to determine the degree of efficiency with which a particular plant is performing its functions, as, for example, the purification effected by a particular sewage by tank treatment and percolating filters. Again, samples may be taken simply with a view to finding out whether the quality of the liquid under consideration complies with a particular standard.

In the former case, in order to be in a position to judge of the efficiency of the plant, it is necessary to know the strength and character of the sewage as well as the quality of the effluent. In the latter case this is unnecessary, the sample either passing or failing to pass a given standard.

It is of the highest importance that the sample taken and shall be duly representative of the bulk of liquid from which it is taken, otherwise erroneous deductions may be drawn. Inasmuch as quantitative analyses are necessarily somewhat costly, and gauging average samples often involve a good deal of trouble and expense, it is very advisable, on these grounds alone, that the sample or sample drawn shall be as nearly representative as possible.

Nearly all waste liquids, especially those resulting from industrial processes, vary, not only in character but also in volume, from minute to minute, from hour to hour, and from day to day. Sewages, moreover, may also vary seasonally by reason of the influx of subsoil water and other factors; they vary markedly when heavy rainfall occurs.

If it is desired to ascertain the quality of a particular liquid at any given time, a single sample (termed a "chance" sample) will often suffice for the special or casual purpose for which it is taken. If, on the other hand, the character and strength of the liquid as a whole is what is to be determined, average samples will be essential—that is to say, samples taken according to the rate of flow of the liquid over at least four days.

SEWAGE LIQUORS.

It will be obvious in the case of sewage liquors, which in dry weather vary in strength roughly according to the rate of flow, that if the hourly proportional flows for five consecutive hours are 10,000, 30,000, 50,000, 40,000 and 20,000 gallons then samples merely drawn in equal quantities every hour will not represent the average strength of the liquid for the five-hour period unless the sewage is hourly of constant strength; whereas, if the samples are drawn hourly according to the rate of flow in quantities of, say, 100 c.c., 300 c.c., 500 c.c., 400 c.c., and 200 c.c., and mixed together, an average sample closely approximating to the truth will result. It follows, therefore, that in sampling for average strength the hourly rate of flow of the sewage must be ascertained; in other words, the flow must be gauged continuously while sampling is in progress.

Average samples of sewage liquors were taken as long ago as 1872 by the committee of the British Association at the Romford sewage farm, and probably long before that date, for liquors other than sewage. Average samples of sewage liquors have also systematically been taken by the Sewage Disposal Commission appointed in 1898, and it may be of interest to describe the method of taking average samples of sewage from start to finish, since sewages and sewage liquors are more likely to be of general interest than the sampling of waste liquors from manufacturing processes.

The first preliminary to be settled is the duration of the period over which the samples are to be taken. In the majority of cases four sets of twenty-four hours average samples, commencing Monday morning and ending Friday morning, will give a good idea of the character and strength of the sewage. In the case, however, of a large town, sets of average samples extending over seven days, repeated at different seasons of the year, may be necessary. In the case of domestic sewages from small communities, the first four or five days of the week usually constitute a sufficient period to provide data upon which, say, works could be designed; the omission of sampling the Saturday and Sunday sewage, which is often weaker than normal on these particular days, provides a certain factor of safety.

It is always desirable to draw average samples of sewage in dry weather, and hence it is necessary to determine what shall be regarded as dry-weather sewage flow.

The extent to which rainfall will affect the sewage flow will depend very largely upon local conditions, such as the nature of the sewerage system, the character and gradients of the surfaces of the drainage area contributing to the sewers, together with many other factors; but it depends, other things being equal, chiefly upon the intensity of the rainfall. For example, a rainfall of ·05 in., or even more, following dry weather, and spread evenly over several hours, may produce little or no appreciable effect upon the flow of sewage, certainly not sufficient to put a stop to the taking of samples; but the question of continuing or abandoning drawing of samples must be left to the discretion of the sampler, who will generally be able to gain some idea from the sewage works manager as to whether or not the sewage flow is being materially affected by rainfall.

If two or three days precede the sampling operations, so much the better; but it is impossible to predict seven to ten consecutive days of dry weather in this country.

Since an automatic height recorder in connection with the gauging operations is advisable whenever it can be obtained, it is a good plan to fix a weir and run the recorder for seven to ten days before actually commencing sampling, thus obtaining a series of charts showing the general run of the sewage flow; comparison with these charts when rainfall occurs will generally show when it is inadvisable to continue sampling for the time being.

With regard to rainfall records, at most sewage works of any size, a rain gauge is kept on the works, but if there is not one in use, a 5-in. gauge is easily erected, and records should be taken at 9 a.m. daily during the sampling. If a rain gauge is to be found in the town itself, daily records should be obtained from this source also, as it by no means follows that the rainfall in the town and on the works will be identical.

APPARATUS.

Now, as regards the apparatus required for taking twenty-four hours average samples of crude sewage, about thirty, or, better still, thirty-six wide-mouthed glass-stoppered bottles will be needed for chemical analysis; the use of the extra bottles (apart from chance of breakage) will be apparent later.

If samples for bacterial analysis are needed, a few small glass-stoppered sterilised bottles will also be wanted; these will generally be sent ready sterilised direct from the laboratory, and one or two of such bottles can be filled from the large mixing bottle when the twenty-four hours' average sample is made up. The stoppers of all the bottles, both chemical and bacterial, should be carefully ground in with fine emery, and the foot of each stopper rounded to avoid shutting in air bubbles.

As regards capacity, the larger bottles should hold about 600-700 c.c. each, and the sterilised bottles about 50 c.c. each. A large glass mixing bottle, holding about 1½ gallons, will be wanted for making up the average sample from the twenty-four separate hourly samples, and also a couple of thick glass stirring rods, and a measuring glass graduated in cubic centimetres; two thermometers, grease chalks, two or three drying cloths, and some adhesive labels complete the outfit. The bottles used for holding the mixed twenty-four hours' average sample are generally half-winchesters, holding about 1,300-1,400 c.c. each; but for special purposes a winchester is sometimes required.

Turning to the gauging outfit required: The method of gauging employed will depend upon local conditions. Whenever practicable, a wooden dam, with a brass or gunmetal rectangular weir plate screwed to the face of it is the simplest method, the whole of the flow to be gauged passing over the weir, and the depth of liquid over the weir sill being registered continuously by an automatic height recorder. "Plastic," or a mixture of clay and boiled linseed oil, is useful for making watertight joints between the margins of the wooden dam and the channel walls.

* Paper read at the Annual Congress of the Royal Sanitary Institute at Blackpool.

It may be well to point out here that [illegible] on the [illegible] of the [illegible] of [illegible] to be kept in mind.

(a) The width of the weir should not exceed three-quarters the width of the channel in which it is placed.

(b) The thickness of the metal at the lipped falling edge of the weir should not exceed [illegible] of the transverse sectional area of the lipped [illegible] immediately above the weir.

(c) The weir and the lipped channel should be perfectly [illegible], and have a free overfall and air space underneath the falling sheet of water, while the float of the automatic recorder should be placed sufficiently far back from the weir to avoid curvature of surface.

As to the type of recorder, I have always used a small portable Glenfield and Kennedy machine, the drum being driven by a seven-day clock, and the pen actuated by the up and down movement of the float. There are, however, several automatic height recorders on the market, some of them with pen or pencil cams cut to give the discharge direct upon the chart. It is not, however, a difficult matter for any engineer to construct a simple and reliable machine for comparatively little outlay. Care is required in adjusting the pen to zero on the chart, which should be carefully pressed down to the rim at the foot of the drum.

Most recorder pens have an up and down range of 6 in., so that the depth over the weir must be limited to about 6 in., unless the minimum early morning flow exceeds, say, 1½ in. depth over the weir, in which case the recorder can be made to register up to 7½ in. by setting the pen at zero on the chart when exactly 1½ in. of liquid is passing over the weir, the chart base line thus reading 1½ in. above sill level. The recorder should be set up perfectly level, and the float, if in an exposed situation, should be surrounded by a cylinder of fine perforated zinc, to eliminate wind action, otherwise oscillation of the float will soon exhaust the ink in the pen, besides blurring the chart. It may be mentioned that a mixture of glycerine and cochineal, or any [illegible] makes a good ink for a recorder pen.

Having erected the weir and recorder, the sample bottles should be prepared and the time for commencing settled. Assuming 9 a.m. to be the hour determined upon, and that average samples of crude sewage are to be taken, the recorder should be started at 9 a.m., and the first sample of sewage taken at 9.30 a.m., the second at 10.30 a.m., and so on hourly until 8.30 p.m. on the following morning, when the first set of twenty-four hourly samples will be complete. The filling of each bottle is usually most conveniently done at the weir sill.

It will be found convenient to write on each bottle the nature of the liquid, the date, and the hour of [illegible]. This can be done with grease chalks upon the glass direct, or adhesive labels can be used.

As each hourly bottle is filled the stopper should be allowed to sink down gently into place in the bottle neck; if this is not carefully attended to there is considerable risk of air bubbles when on [illegible] crude sewage rapidly [illegible] upon the bottle. After stoppering the bottles they should be set in a row in the order of the times at which they were filled. It will be found, when the twenty-four bottles are ranged in a row, that a wonderfully good idea can be obtained visually of the variations in the character of the sewage throughout the twenty-four hours.

[illegible]

A point [illegible] to the [illegible] of fæces in a sample. Although they are usually omitted when taking chance samples direct with half-winchester bottles, this would appear to be a faulty method of sampling in certain cases, especially where the crude sewage subsequently undergoes treatment in septic tanks. If they are included they will need to be broken up in the hourly sample bottles before the proportionate amounts are drawn off.

After the last of the twenty-four hour samples has been taken, and the recorder pen has reached the 9 a.m. ordinate on the chart, the chart can be removed and replaced by a fresh one, and the hourly rates of flow worked out and entered up on the finished chart. The date, rainfall (if any), and other notes of interest should be recorded, such as times of weakest and times of strongest sewage, flushes of trade wastes, &c. For working out the hourly flows on recorder charts, I use a special slide rule, which has the advantage of shortening the labour considerably. In the case of a recorder provided with a cam, the discharge can, of course, be taken direct from the chart, but with a recorder that only [illegible] the height, height [illegible] have to be translated into discharge diagrams.

The next step is to take from each bottle, commencing with the 9.30 sample, an amount proportionate to the rate of flow for each hour, and to transfer it to the large mixing bottle. Assuming the flow for the first three hours to have been severally [illegible], 6,400 and 5,400 gallons per hour, then [illegible], [illegible], and [illegible] are taken from the first, second, and third bottles respectively, these amounts will be proportionate to the rates of flow for those hours, and the same procedure must be followed with the twenty-one remaining hourly samples.

The measurement of the liquid from the hourly sample bottle is best effected by means of a tall glass cylinder graduated in cubic centimetres. Before the sample bottle is unstoppered it should be turned over once or twice to mix the contents, and any large solids should, if present, be broken up with a glass rod. In many cases the hourly amounts to be taken from each bottle can be obtained by knocking off two or more figures from the right of the hourly rates of flow, and if the figures thus obtained are inconvenient, the whole of these can be either divided or multiplied by a common factor. Care should be taken that the aggregate of the figures adopted are sufficient to yield enough liquid for the final sample; and it is better, if this can be done, to take sufficient liquid to fill two half-winchesters in case of breakage of one of them.

The working out of the chart and the sub-sampling, together with the entering up in the proper hour spaces of the chart of the times of strongest and weakest sewage, presence of trade wastes, &c., take some considerable time; and while this record is in progress the reserve bottles previously mentioned will be needed to take the first few hours of the second set of samples.

When the proportionate contents of the twenty-fourth hourly sample bottle has been transferred to the mixing bottle, the whole of the contents of this large mixing bottle should be gently agitated while the half-winchester bottle or bottles are being filled from it, in order to keep the suspended solids evenly distributed throughout the liquid. After the half-winchesters are thus filled, the hourly sample bottles can be emptied, washed out with clean water, and set to drain. In cold weather, half-winchesters, or winchesters filled with sewage, tank liquor, or effluent, should be filled brimful, and the stoppers gently worked in, and tied down with a piece of calico or string; in hot weather, and also in keen frosty weather, a small air space may be left at the top of the bottle in the case of sewages or tank liquors. The samples should be despatched to the laboratory carefully packed in wicker cases or hampers, nothing being better than old crumpled newspaper for packing the bottles in. It is often useful to have a special sample of the weakest early morning sewage, taken in a half-winchester, to be examined for nitrates. These, if present, indicate the presence of subsoil water in the sewage.

It may be noted that in the case of very small sewage works, where an automatic height recorder cannot be obtained, depths over the weir can be taken with a thin steel rule one edge of which is ground thin. Depths should be taken sufficiently far from the weir sill to avoid curvature, and it will be found that if the rule is rubbed lightly against a block of wet clay and allowed to dry before each reading, the exact depth can easily be seen at a glance. The gauging of sewage flows in this way is very tedious, since readings should be taken every ten minutes, or at even shorter intervals, should the flow of sewage fluctuate much, as will almost certainly be the case with a small sewage works. At least three observers are needed for the twenty-four hours for taking sill depths and drawing samples.

There is another method of taking average samples, in which samples are taken at regular intervals throughout the twenty-four hours, each of these samples being analysed separately; a "weighted sewage" can be obtained by multiplying each separate analysis by the rate of flow at the time the sample was taken, the results are then added up and divided by the total flow.

Some years ago the writer, having occasion to take a large number of average samples, designed an instrument for taking samples directly proportionate to the rate of flow in one operation. Briefly described, the instrument consisted of a paraboloid

copper tube or contact [illegible] 12 in. long, tapering from about [illegible] in. at the bottom to about 2 in. at the top, the several diameters being calculated from the weight [illegible]. This tube was attached to a sliding metal stem working up and down in a socket carried on to a rod pivoted with a thin sole plate upon which the tube rested when the sample was taken. When in use the tube was carried on the [illegible] tank liquor or effluent, and the sole plate placed in the sewage [illegible] which was about [illegible] in., i.e., the thickness of the sole plate below the level of the sewage. The sewage was then dropped through the liquid on the sole plate, and the [illegible] liquid passed off through the [illegible] bottle, a ring rather projecting in a groove in the foot of the plate prevented any escape of liquid, while a spring clip at the head of the metal stem kept the contents tube well home against the washer. In this way, a sample of a portion of liquid was withdrawn proportionate to the flow of liquid, in other words, proportionate to the height of liquid flowing over the sill. Like most automatic contrivances, however, while possessing many marked advantages with certain liquids, containing suspended matter of moderate size, it had also several drawbacks, and the larger and more tedious method already detailed is to be preferred in most cases.

There are numerous automatic samplers to be seen in use at several sewage works, most of them actuated by a small water-wheel driven by a flow of sewage, tank liquor, or effluent.

TANK LIQUORS AND EFFLUENTS.

The sampling of tank liquors and effluents is effected in a similar manner to that already described for sewage, and it is easier, because less complicated by solids; and when both sewage, tank liquor, and effluent are sampled at the same time, it is often convenient to draw what are known as "corresponding samples." By corresponding samples is meant the taking of two or more samples of the same liquid in its different stages, a certain interval of time or "lag" elapsing between the drawing of each of the said samples. For example: Assuming a sewage to be flowing at a uniform rate into a tank having a fixed [illegible] capacity, and that a sample of the sewage is drawn as it enters the tank, a sample of the tank liquor taken six hours later will be a sample, other things being equal, corresponding to the sample of sewage.

It is often necessary to use dyes, such as the resin eosin, in order to follow the progress of a particular liquid through several processes. For example, if the temperature of a liquid entering a settling tank is much higher than that of the liquid in the body of the tank, short cuts through the tank at the surface are almost certain to occur, and a dye, such as fluoresin, shows this at once. Samples should be taken just before the dye appears, the sampling point to avoid including the dye in the sample.

Corresponding samples are also exceeding useful in showing the relative amount of work brought about by the several stages of a purification plant, the only objection to them is the time occupied in obtaining a complete set. It may be noted that the alkaline figures on analysis will usually but not invariably, show whether the samples of sewage liquor correspond properly. This indication does not, however, be a safe guide in the case of sewages containing trade wastes.

EFFLUENT FROM CONTACT BEDS.

With regard to the taking of samples of effluent from contact beds, it is well known that the quality of a contact bed effluent varies considerably as the bed is being run off, being worst when the outlet valves are first opened, afterwards gradually improving until the bed is practically empty. It has also been found to be the case that samples taken at the period of mid-flow from the bed, approximate closely to the average quality of the whole of the effluent discharge, and it is therefore sufficient, in the majority of cases, to take a sample at mid-flow from each particular bed discharge, and to mix the whole of them together to make up the twenty-four hours' average sample.

Storm-water samples can be taken automatically, if desired, by fixing a vessel on the side of the storm overflow manhole at the level at which the required dilution occurs.

Care should be taken in sampling all sewage liquors that no sediment is stirred up in any channel or manhole and mixed with the sample, otherwise the sample becomes worthless. This is of especial importance in taking samples of effluent.

It is, perhaps, not generally realised how much effluents vary in composition in the course of the twenty-four hours, even in the case of land effluents, and when it has been customary to take a sample of effluent regularly at the same hour daily, it is often surprising to see the difference shown by average samples taken over the whole twenty-four hours.

TRADE WASTES.

The sampling of trade wastes stands on a different footing to the sampling of sewage liquors. A thorough working knowledge of the particular trade in question is needed if the sampler is to take representative samples. Trade wastes vary in character in short intervals of time, owing to the different operations which are frequently in progress at the same time at the one manufactory, as, for example, where bleaching, printing and dyeing are carried on simultaneously at the same works, as is often the case.

In the case of many trade wastes, when taking average samples it is advisable to take a sample every five or ten minutes owing to their rapidly varying character, and each separate sample should be tested with litmus for acidity or alkalinity, and the temperature noted. It is frequently desirable to take samples of each of the various liquors from a manufactory as well as of the general or mixed waste; in such circumstances, difficulties in arranging the flow are apt to arise, the contents of vats being let off with a rush in the space of a few minutes, the chart of the recorder consequently showing an abrupt vertical line which cannot be integrated for discharge. In such cases a number of dip samples may be taken, and the capacity of the vat or tank taken, and noted in pencil on the chart at the proper point.

At some manufactories with which the writer is acquainted, a variety of gauging expedients have been necessary in order to arrive at accurate information as to the volume of discharges.

Most trade-waste investigations demand a rather elaborate scheme to be laid down before satisfactory sampling can go forward, and since the analysis of many of these wastes is laborious and intricate, and consequently costly, it is very advisable that as in the case of sewage liquors, the samples shall be as far as possible representative of the liquids from which they are drawn. Many trade wastes, it may be mentioned, do not, owing to their nature and colour, admit of the use of eosin or fluoresin for tracing the various liquids through their several processes.

RIVER SAMPLES.

River samples require considerable care in taking, especially where large rivers are concerned, and where bacterial samples are in question; the boat from which the sampling is done often itself carries contamination on its sides at the water line. All river samples should, wherever practicable, be cross-sectional [illegible] and a number of samples should be taken on a line normal to the axis of the river—and these should be mixed together for the final samples.

For the taking of surface samples in large rivers, I have found two glass tubes of ⅝ in. internal diameter wired together, and about 18 in. long, exceedingly useful. As a boat is rowed very slowly along the section line, dip samples are rapidly taken every 6 ft. or so, alternately 6 in. and 2 in. deep, and the fingers or palm of the hand closed over the top apertures of the tubes, which are then quickly emptied into a glazed earthenware pail. If corresponding samples are needed, the river water should be coloured with fluoresin when the first set of samples are taken, and practically the same body of water can then be detected and re-sampled lower down. Two or more samplers are needed for taking the second sample as quickly as possible, just before the dye reaches the cross-section. To those who have been accustomed to judge the average velocity of a river by the mid-stream surface velocity alone, the slow average rate of flow shown by the fluoresin will come as a revelation.

There are many other ways of taking special samples, such as deep-well samples, many of them requiring specially designed and expensive apparatus, but they are perhaps of special and not general interest, and for that reason they are not included in this paper. In conclusion, it may be observed that, although the procedure involved in obtaining true average samples may appear at first sight to be too refined for general use, it should be carefully borne in mind that a substantial error in the strength and character of a sewage—such as may very easily arise if a few casual samples taken at haphazard are relied upon—may be the cause of sewage purification works being constructed not competent to bring about a proper degree of purification of the sewage they are called upon to treat.

Town Planning and Amenities.*

By S. D. ADSHEAD.

[illegible] the Town Planning Act [illegible] that amenity and convenience [illegible] the laying out of [illegible] and towns. It is not attempted to discuss here questions relating to convenience, but to emphasize the importance of providing amenities. Exactly what is meant by amenities it is difficult to say, but it must be assumed that it includes the provision of pleasant places to live in, work in, of healthy homes, and towns interestingly laid out, so that life can be enjoyed in the fullest sort of way.

In town planning schemes under the Act and now under consideration in reports, inquiries lead and information on maps prepared indicate that convenience of arrangement is the main advantage that has so far been aimed at, and perhaps quite rightly. The drafts of town planners have certainly been concentrated on this. Questions relating to the provision of amenities have no doubt in many cases been considered, but so far they have not been given the first place which they certainly merit.

Roads and transport facilities are, after all, but means to an end, the end being the incidents, the buildings, the open spaces and the parks. But is this all? Only in an indirect sort of way. The true end of town planning is to provide schemes that will ensure that towns will be erected in a way that will inspire the citizen, elevate his imagination, refine his simplify his existence, and encourage him to live nobly. This, then, is the true end of town planning, to which all methods and schemes for the provision of convenience and healthiness but point the way. This is the goal to which sound town planning must constantly move. Amenity is the one asset which questions of convenience and economy must never allow to go unconsidered. But how to be assured that amenity as well as convenience will actually be included in the plan. People have grown too blithe and casual in the use of words like "beauty" and "artistic," and use them so loosely and recklessly that it is an empty statement merely to say that the consideration of amenities means giving beauty to the scheme and an artistic rendering to the finish. One says that there shall be beauty in the garden suburb, that the houses are to be erected in an artistic way; but what does it all really mean? Let these terms be dropped, and others used that are more exact; let an endeavour be made to get a little near the truth. Everyone desires amenities, but it savours of effeminacy and superficiality merely to desire existence in a district described as beautiful and artistic, and one is not quite sure if beauty and nothing but beauty is wanted at every turn. What is wanted, however, is that everywhere fine character and character of the right kind shall prevail. In a search for this one is on sure ground.

Of all human interests, none surpass in attractiveness the interests of personality, closely associated with which are the attributes of character, tradition, and incident in history. Get the personal interest in all that is designed, give it correct character, let it be the outcome of tradition, and let it be the last chapter in the panorama of a great history, and beauty will take its place, real artistic results will follow, and the surroundings will be enjoyed without the necessity of calling them artistic and beautiful without complying with a commonplace idea. To give

THE BASIS OF A TOWN

right character means that each feature and incident must look the part, a part which is the best that can be played. But let this be applied in concrete terms, this application of right character to the town.

The country road must in every sense be part of the country-side. If it is a great highway, then it must have an asphalt track. If it is a road for pedestrians, for carts and cattle, then it will not need a path. Nowhere in open country does one need kerbs, or sidewalks which look like urban tracks. People who walk out in the country are always prepared and enjoy walking on the grass. The margin and borderings must not be kept even and cut, for nothing comes nearer nature than a natural strip of grass. In a suburb the grass margin becomes a continuous park. It is covered by many people passing to and from town, it should be kept neatly cut, and should suggest that it is closely allied to the neatness of the town. One needs to appreciate these things, what is meant by the rusticity of a village green, the formality of a town garden, the pseudo-rural of a suburban park, and the wildness of a public reserve, where primitive Nature is to be seen, perhaps enjoyed, and where complete change is to be found from the formality of the town.

But it is not only in the general design of roads and parks that the provision of right character must be ensured; it is also in their detail, in the colour of the macadam, in the thickness of the kerbstone, in the character of the foliage, in the fence, in the railings, and even in the kind of seat that is placed in the path. How frequently is the groundwork of the picture completely spoiled with red brick chippings that are sore to the eye, and cry out so loud. Or, worse, with black ash, reminding one of everything that is squalid—the excretion of an industrial age. How often does one see great granite kerbs to grass margins, sufficiently heavy to form a good edge to a dock. How often there are iron fences of spiked, rounded iron where a post and rail painted white would be all that is required.

A tall railing is a fine thing when well designed, but the ¾-in. round iron, spiked at the top and set up in bays, is fit only for temporary purposes, and as a permanent public fence is a thing absolutely to be abhorred. It has a cheap and nasty look, it smacks of economy, it is an insult to the good behaviour of the public, and, lastly, it has no place in the finest memories of park or glade. By all means, if one has to have tall railings, let them be good ones; let inspiration be sought in the fine eighteenth-century example which surround all the old parks; anything is better than the cheap spiked example which, unfortunately, is so frequently met.

Few features in the detail of the garden are so objectionable as a vitreous tile edging or brown glazed coping to grass. Unfortunately this crude method of edging grass is in very common use. No doubt it saves cutting the edges; but how hard! how unsympathetic! One does not see such crudeness in old gardens, nor even in any of our older parks. If the upkeep is so great that it costs too much to keep our turf edges cleanly cut, then they should be left like the edge of a village green. It is dangerous to make rules; a tile edge to the paths of a small Dutch garden might look well, but a vitreous enamel or brown glazed coping round the edge of a lawn is abominable.

And how often are there asphalt paths, terra-cotta vases and terracings in red stocks, ornamenting places which would be in far better character if left, say, like Hampstead Heath, or some woodland glade. Complaints about the rates are universal; why spend so much in making beautiful fields into ugly parks? But

THE WRONG SORT OF CHARACTER

is not only given to streets and parks; worse sins have been committed in allocating the different interests in a town. How often does one find the corporation works—the gasworks, power stations and corporation yard—occupying the choicest residential sites in a town; the scullery sink and stove fixed in the drawing-room bay. Here it is thought both foolish and stupid, but is hardly noticed in reference to an incident in a town. Mortlake, for example, in its evident enthusiasm for economy, has, in its innocence, committed this great crime; but Mortlake, sad to say, is not alone. It is only by fully appreciating the peculiar significance of each site and separate area, and by using it in the most natural way, that the best traits in its character can be brought out.

Or, again, why always choose for hospitals and workhouses the most valuable and attractive of sites?

> "Beggars may not be to find them in an evil day,
> But beggars have tongues and can enquire the way."

And why, if such pride be taken in wide streets and open spaces, are they filled with the litter and impedimenta of the town? How many market

* Paper read at the Annual General Meeting and Conference of the Institution of Municipal and County Engineers at Cheltenham.

[illegible] street crossings, and street [illegible] themselves characteristic only as open spaces and as the roads are completely spoiled by the erection about them of cabmen's shelters, tool sheds, ambulance stations, to say nothing of public urinals and all sorts of abortions in the way of trolley poles and ugly lamps?

When there are open spaces, by all means [illegible] to preserve their open character, which [illegible] difficult above all others they should retain. Only the other day there appeared in an architectural journal a scheme for filling up one of London's finest thoroughfares—Whitehall—by planting down its centre an avenue of suburban trees. Of all the mistakes made in instilling wrong character into the surroundings of a town home are in greater need of correction than those brought about by the wrong planting of trees.

The solution of many of these issues is, after all, usually found in nothing more involved than the exercise of common sense. The perception of right character and the possession of sound common sense are very closely allied.

But of all the sinners in the matter of town character study perhaps the architects are the worse. This is not an occasion to point out in detail the blackness of their crimes; but what can be more stupid than sham half-timber in the centre of a town—what more characteristic of bad taste and lack of sense than the country cottage erected in an urban district, when there is such a fine tradition of urban architecture all around? What a restless uncertainty is seen when many modern housing schemes are compared with the quiet refined architecture of many a slum. How restrained in its architecture is the slum. One is often forced to realise that poverty is its only crime. If vulgarity and ostentation were, as architectural sins, regarded as equally criminal with poverty, how much modern architecture would fail.

Everyone appreciates

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because he is a practical man. If he were not practical he would not be depended on. Everyone relies on the opinion of the engineer, just as everyone questions the reliability of the architect and ridicules the incapability of the artist. But the modern engineer must be more than a practical man; the pride of the practical man is his undoing in the long run. As a personality he is seriously wanting, for, after all, we are creatures of imagination, and our greatest joys and finest experiences are not met on the roads and in the ruts of so-called practical schemes.

Engineers should guard against entirely concentrating their energies on increasing their rateable areas and reducing the rates. Both policies are, when regarded as the end, shortsighted and sinful. There is only one policy to be practised, and that is to increase the amenities of every acre of the town.

It may be said that such things depend entirely upon funds, but it is not so. There is a constant cry that land is too dear for the creation of parks, that it is too expensive to erect dwellings for the poor of a less height than five or six stories, that wide streets take up too much land, and so on. If a law were enacted that so much land was to be given up to parks, that no dwellings were to be over three stories in height, and that no main thoroughfares were to be less than 100 ft. in width, then the price of land would of its own accord adjust itself to the limits and conditions of its use.

The provision of amenities is not a question of funds, it is a question of brains. The new responsibilities that the Procedure Regulations of the Town Planning Act are placing upon the shoulders of the municipal engineer should stimulate his endeavour and broaden his outlook. He must not undertake more than he can chew. When engineers undertake architecture there is always a terrible collapse. Leave your architecture to the architect. Engineering, when seriously undertaken, is a much bigger thing; and, finally, let the municipal engineer remember that perhaps his greatest and grandest performance is to leave a mark of good character and sound sense, or, in other words, considered amenities all over the town.

On the presentation of the foregoing paper at the town planning conference held in connection with the annual meeting of the Institution of Municipal and County Engineers at Cheltenham,

Mr. H. E. STILGOE (Birmingham) said those who knew Prof. Adshead would know how much "fine character" meant. [illegible] devising a scheme for arterial roads not to include just those little touches of character which either made or marred a scheme. It might be that a fine road offered all facilities for traffic, but was the most [illegible] the author of the paper.

Mr. J. W. [illegible] (Great Yarmouth), seconded the vote of thanks.

Mr. A. J. PRICE (Lytham) said that Prof. Adshead had always taken the view that in town planning the architect and the engineer should work together—which he thought was quite the right thing to do. [illegible] at the utilitarian side, and could not get the money to carry out the ornamental portion as they would like to do. Near the town that he represented a very [illegible] houses, but he had introduced into what was essentially a town street [illegible] would look very well on the Cotswolds or in a 20-acre field, but were incongruous where they were placed. He pointed out the incongruity and he was glad to say that the architect saw his point.

Mr. J. A. BROOIE (Liverpool) [illegible] and architects needed [illegible] and he wished Prof. Adshead had slated them a bit more severely all round. He could say, if hard pressed, they could retaliate [illegible]. They could call attention to a number of houses which were being built in the North. But they could not blame the municipal engineer for that. He should like to bear witness to the good work Prof. Adshead was doing in educating young fellows in town planning. It was work which really needed doing, and he thought Liverpool's example in this matter might be copied by London. It was being done, he believed, by the provision of a chair of town planning.

Mr. E. M. BATE (Frinton-on-Sea) said he believed that town councils needed educating, as there was a good deal of local prejudice to be encountered where architectural questions were involved.

Mr. R. H. WINTERBOTTOM (Irlam) said they had a good deal of heavy traffic in the streets which made necessary the concrete slabs which Prof. Adshead described as horrible.

Councillor LIGHTWOOD (Lytham) remarked that as soon as local rates could be lightened the town councils would be only too glad to consider the question of amenities.

Prof. ADSHEAD, in replying, remarked that as to architects not being quite so fitted for providing amenities as they represented, there were architects and architects just as there were surveyors and surveyors. The question must be taken generally. Money which was spent on so-called amenities was often not spent in the best way. He had seen beautiful fields converted into ugly parks. He would like to see bigger open spaces, and wider roads of a more solid nature. He was frightfully down on ashes, they gave such a bad character to a town. They must get rid of the bane of ashes in the North of England. When at Oldham he went through the garden suburb there, and they had a system of putting limestone chippings with some bituminous tar, and that worked down beautifully.

Waterproofing of Concrete.—All the concrete floors in the basement of the Nurses Home, South Manchester Guardians, Withington, have been treated with Pudlo to prevent rising dampness.

Sleaford Market Purchase.—There was no opposition at an inquiry conducted at Sleaford on Wednesday, on behalf of the local Government Board, into the urban council's proposal to borrow £2,300 for the purchase of private rights and tolls of the Sleaford Market. The council, it was stated, are paying twenty-five years' purchase on the income which Lord Bristol at present received from the lessee of the market place, which was distinct from the cattle market.

School Buildings as Hospitals.—The Board of Education, in a circular addressed to local education authorities in response to inquiries, says that in the opinion of the Director-General of the Army Medical Service no emergency has yet arisen, or is likely to arise in the near future, which requires the actual occupation or preparation of school buildings, other than those which have already been requisitioned for use as hospitals to accommodate sick, wounded, or convalescent men serving in the Army.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to the Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

Mr. H. G. Lewis, of Crumlin, has [illegible] the following [illegible] in the [illegible] for June and [illegible] daily [illegible] to him:

"Quantities." Vol. I., by J. Bartlett (St. Bride's Press, Limited).

"How to Estimate," by J. T. Rea (Batsford).

"Guide to Surveying Assistant," L. G. Stephenson (Batsford).

Results, by Stephenson (Batsford).

QUESTIONS.

This week answers are invited to the following questions:

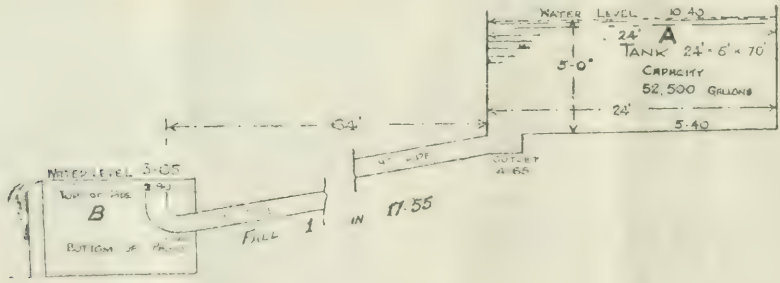
416. Concrete Floor.—Give two sections of a reinforced concrete floor for a span of 30 ft., showing the sizes and weights of the girders, and giving the necessary calculations. (K. G. F., *Buckfastleigh.*)

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. (Xing.)

418. Iron Curved Roof.—Show details of an iron curved roof of 40-ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G. F., *Buckfastleigh.*)

419. Practical Mathematics.—Explain a graphical method for solving simple simultaneous equations, and give a worked example.

420. Flow of Water.—Assuming that the lower tank B in the accompanying diagram is full of water, and that the 9-in. pipe of [illegible] would it take to empty tank A if the outlet was open full bore? (A. S., *Beverley.*)



[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

415. Sewerage.—What conditions generally determine the adoption of either the "separate" or the "combined" system of sewerage in a town? ("Ajax.")

The "combined" system of sewerage, which is far more extensively used than the "separate" system, means that all the sewage, rain water, surface water, and, in fact, all the drainage flows to the sewers. By the "separate" system, on the other hand, is meant that in which sewage proper only [illegible] the sewage [illegible] and surface water to [illegible] sewer. Before studying the conditions which determine the adoption of either of these systems, it is necessary to consider the relative advantages and disadvantages of the two systems. They are as follow:

(a) *Advantages of Separate System.*

(1) A saving in the quantity for treatment on wet days. There is the same amount and quality of sewage to be treated every day.

(2) In pumping schemes a similar saving in the cost of pumping.

(3) Smaller cost of outfall sewers.

(b) *Disadvantages of Separate System.*

(1) Impossibility of obtaining the absolute separation of storm water from sewage proper.

(2) Necessity for duplicate system of drains throughout the district, with consequent liability to confusion in connections.

(3) Extra cost of construction and maintenance of duplicate system of sewers.

(4) First washings from storm sewers are most impure, and quickly lead to the pollution of watercourses.

(5) Further expense is incurred by the adoption of some arrangements for flushing the sewers.

The combined system of sewerage is used in most towns, but it is somewhat difficult to treat the sewage owing to the variable amounts received from day to day. The separate system is used in several boroughs just outside London—such as Tottenham, Hornsey, &c. Where a town is situated at or near the mouth of a river, or for a seaside town, there can be no difference of opinion as to the system to be adopted, for, since the sewage can then be easily disposed of, the combined system is obviously preferable. For an inland town situated near a river, the separate system is generally used, for the surface water can be run into the river, and the sewage, after being treated, is subjected to land treatment. But the condition that has most to do with deciding which form of sewerage is used is that of the position of the town to be drained and the nature of the district. Where a town is situated inland, and away from any river or the seashore, the sewage would have to be disposed of by some method of purification. In such a case the separate system would undoubtedly be adopted, for it would be advisable to have as little sewage to treat as possible, and hence all water which is not sewage proper is kept out of the foul sewers. Again, if the town is situated partly on a hill and partly in a valley, and the outfall sewer is on the high level, thus necessitating pumping the sewage from the lower area of the town, it would be advisable to have the separate system (at least in the lower area), as by this means the amount to be pumped would be very much reduced. On the other hand, if the sewage is of a weak kind, and hence does not require much purification, it will

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probably be as cheap to purify the whole of the sewage proper and storm water, to have a separate system for it. In connection, it will be seen from the above arguments that, except under special circumstances, the combined system of sewerage would usually be adopted. (F. W. P., *Rickmansworth*.)

The separate system, if carried out in its entirety, is a very complicated arrangement, there being two complete sets of drains and sewers, one for the storm water and one for sewage, and there is always some danger of connecting the sewage drains to the storm-water sewer, and vice versâ. On the question of first cost, the separate system is probably more expensive. The comparison is very difficult, however, and varies according to the district. If the district for storm water sewers can be divided into a number of areas, discharging at different points, thus keeping all the sewers of small size, it is just possible that the separate system might be the cheaper, but if both sets of sewers had to be conveyed some distance away from the town before they could be discharged, it would most decidedly cost more than the combined system. It should also be borne in mind, in comparing the cost, that each house has to have two sets of drains, practically the same size as if only one set was installed. A point largely affecting the system of sewerage is the system of sewage disposal, as some methods of disposal are not so easily adapted to variations of flow as others. If land treatment is adopted a very large area will be required unless storm-water beds are installed; while, if it is a sea-coast town and the sewage need not be treated at all, there is no object in providing the two sets of sewers. If, as in low-lying towns, all the sewage must be pumped before it can be treated, it is evident that, from the point of view of annual cost, it is desirable to exclude as much storm water as possible. It also requires more subdividing and greater stand-by plant with the combined system to deal with the fluctuating flow, unless storage tanks are provided to take the excess that the pumps cannot dealt with. It must be pointed out, however, that even in the strictly separate system some storm water always finds its way to the sewage sewers, and allowance has to be made for this at the disposal works in any case. Also, that the first washings from the backyards and streets are quite as impure as ordinary house sewage, and if discharged into streams without treatment will probably give rise to complaints. If there is an existing system of sewerage in the district to be redrained, and it can be used for storm water, this is often a deciding factor in favour of the separate system, as the new drains to be laid may be smaller, and consequently cheaper, than if the combined system was adopted. The system of sewerage most popular is the partially separate system, in which the storm water from the road is run into storm-water sewers and discharged as is most convenient, while that from the backyards is run into the sewage sewers. (J. K., *Fareham*.)

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act ii., 2.

GROUTING AND PENETRATING OF ROAD SURFACES.

To the Editor of THE SURVEYOR.

SIR—With reference to Mr. Green's paper read at the annual meeting at Cheltenham, I am somewhat surprised to learn that Glutrin is, in the first instance, more costly than Tarmac. This may easily be accounted for in the distance as regards the place of manufacture, but, generally speaking, my experience proves the contrary to be the case.

I have recently completed a length of Green's bound road, and have prepared some detail data which, I think, may be of interest to other surveyors. I always think it is very difficult to judge the relative prices of roadways unless the costs of the various materials are stated; for instance, one surveyor may put down a length of road, and another surveyor a similar length in another district, and the cost might easily be considerably more in one case than the other, on account of heavier railway rates, wages, team labour, &c.

The road of which particulars are appended was laid on an existing water-bound main road about 1 mile from the railway station. The area covered was 2,252 sq. yds. Although the road has only been laid two months, I think its success is assured. It is practically dustless, certainly less dusty than tarred limestone, and in no single instance has a loose stone been found since the steam roller left the job.

The road is laid on the concrete system, and it should be noted that 13 sq. yds. 3 in. thick per ton of granite is obtained. This I attribute to the use of dust for mixing with the Glutrin, which goes to show that stone will cover a greater area in a Glutrin-bound road than in the water-bound system and this saving compensates somewhat for the cost of the Glutrin solution.

	£.	s.	d.
200 tons 2½-in. Shap blue granite, at 10s. 6d.	105	0	0
60 tons 2½-in. limestone dust, at 3s. 9d. ..	11	5	0
1,000 gallons "Glutrin," at 10 4/5d. ..	45	0	0
12½ days' steam roller hire, at 25s.	15	12	6
53 days' team labour, at 8s.	21	4	0
Manual labour (6d. per hour)	15	16	9
2,000 gallons water, at 1s. 6d.	0	3	0
5 per cent supervision and use of tools	10	14	0
	£224	15	3

COST PER SQUARE YARD.

	s.	d.
Dust, .026 tons		1.20
Granite, .08 tons		11.20
"Glutrin," .44 gallons		4.35
Rolling, 1.66d. ..		1.66
Labour, 1.68d. ..		1.68
Carting, 2.26d. ..		2.26
5 per cent supervision and use of tools		1.14
	1	11½

YOURS, &c.,

HARRY RIDING,
Engineer and Surveyor.

Burley-in-Wharfedale
August 15, 1914.

WILTSHIRE MAIN ROADS.

To the Editor of THE SURVEYOR.

SIR—My attention has been called to the report of a Mr. J. E. Dockings at a meeting of the Wilts County Council, reported in the local papers of the 8th inst., indiscriminately attacking the thirteen district surveyors, and through them the ten rural district councils that repair the main roads within their districts, under contract with the county council.

Ten rural district councils are responsible for the repair and maintenance of 374 miles of main roads, varying from 15 miles in the smallest district to 64 miles in the largest district.

The county surveyor states in his annual report for the year ending March 31, 1913, the last report to hand, under the heading "Rural Districts under

[illegible] taking his last annual report as a basis, I am prepared to state that there is a steady improvement in the condition of the roads in the district [illegible] In the case of this report, it is different [illegible] Mr. Deacon's words—and the county surveyor has been complaining a long time past that the expenditure on the roads was entirely inadequate, and that the expenditure of the rate at each ward [illegible] I have had the oversight [illegible] in the district in the county for many years, and have always had a good report, and claim I was entitled to it.

When the time and opportunity occurs, I am prepared to prove where there is inadequate supervision [illegible] in the districts under contract.—Yours, &c.,

ONE OF THE TEN.

August 10, 1914.

THE WAR.

To the Editor of THE SURVEYOR.

SIR,—The immediate domestic problems raised by the outbreak of war are second only in importance to the tremendous issues which hang upon the epoch-making events which are taking place by land and sea each day as we write. The organisation of hospitals for the reception of our soldiers and sailors who may be invalided home is happily proceeding apace under the most competent direction, and offers of material aid and personal service involving real sacrifice are pouring in. A problem of equal magnitude will inevitably arise in the very near future by reason of the distress among the poorer classes of the population, which must occur as a result, partly direct and partly indirect, of the outbreak of hostilities. The Government are fully alive to the situation, and although it would be idle to pretend that the coming weeks will not be full of anxiety, there can be no doubt that the proper spirit for those who are forced to remain inactive by reason of age, physical incapacity, or force of circumstances, is one of quiet calm and resolute determination that, as far as possible, suffering to others shall be prevented by avoiding any unnecessary dislocation in the ordinary private and business life of the community. Writing in *Punch*, Mr. Owen Seaman speaks for the vast majority of his fellow countrymen when he says:

"And we, whose burden is to watch and wait—
High-hearted ever, strong in faith and prayer,
We ask what offering we may consecrate,
What humble service share?

. . . . .

To go our quiet ways, subdued and sane;
To hush all vulgar clamour of the street;
With level calm to face alike the strain
Of triumph or defeat."

Yours, &c.,

August 17, 1914. T. S.

To the Editor of THE SURVEYOR.

SIR,—A meeting of the council of the Institute of Sanitary Engineers was held on August 12th, when the following resolution was passed unanimously:—

"In view of the present emergency, it is agreed that the expert knowledge of the members of this institute should be placed at the disposal of the Government, and that a circular letter be sent to all members pointing out the direction in which it is thought they would be of use in this connection, and asking to what extent they would be prepared to serve their King and country."

It is felt that the special knowledge of sanitation possessed by members of this institute might be of peculiar service to their country in this grave crisis. This appeal is addressed only to men who are not serving, and who are not qualified to serve, in existing units of His Majesty's Forces. There already exists a Territorial Sanitary Corps of three companies, and recruits in these companies are urgently required.

It is thought the direction in which sanitary experts could be of most service would be in connection with water supply, drainage, sewage and refuse disposal of encampments and towns in which troops are quartered; also in temporarily discharging duties requiring knowledge of sanitary engineering in positions vacated by men who have been called away to serve their country in some other capacity.

The council think that members who are not able to volunteer for active service may be able to assist in some of the directions indicated.—Yours, &c.,

P. N. HASLUCK,
Secretary.

120 and 122 Victoria-street, S.W.
August 14, 1914.

To the Editor of THE SURVEYOR.

SIR,—The Special Fire Service Force which is to be formed to the British Fire Prevention Committee may shortly require the following for service in connection with the protection of Government establishments, [illegible] outside the London area, and for other national purposes:—

Twelve steam fire engines (with one horse-drawn or motor, with or without mechanics).

Twelve manual fire engines on horse cars.

Twelve land-ladders motor cars (with or without drivers).

Offers to loan the above should be addressed, with full particulars in writing, to the undersigned at 5 Waterloo-place, London, S.W.—Yours, &c.,

LONDESBOROUGH,
EDWIN O. SACHS.

August 13, 1914.

To the Editor of THE SURVEYOR.

SIR,—I sympathise with those surveyors whose horses have been taken by the War Office, especially as it will be increasingly difficult to hire for the same reason.

Certain works of public service requiring team labour must continue to be efficiently carried out in times of war as well as peace, to prevent calamities at home. Strong representations along these lines to the officers at the time of their visit to the council yard here have so far prevented any of our horses being taken.—Yours, &c.,

PERCIVAL T. HARRISON,
Borough Engineer.

Chelmsford.
August 18, 1914.

THE WAR.

SUITABLE WORK FOR THE UNEMPLOYED.

The formation of Distress Committees throughout the country is a step in the right direction, as unquestionably we shall soon be faced with the serious question of how to provide work for the unemployed. It is our duty to be ready with schemes before the actual necessity arises, and although our readers are no doubt busily engaged in the preparation of such schemes the following hints may be of some service.—

(1) *Ordinary Road Work.*—This naturally comes first, as there is always work of this description to be done in the neighbourhood of almost every town; and although the modern systems of road construction and maintenance do not involve the employment of much unskilled labour, this class of work keeps a large number of men occupied, and no doubt many other men could be also engaged.

(2) *Road Widening and Improvement.*—This includes the widening of roads, the improvement of dangerous corners and cross-roads, the improvement of gradients, the formation of footpaths, and many other similar works on which large numbers of unskilled labour could be employed. The Road Board have evidently realised this, for they are prepared to grant no less a sum than £1,000,000 for such works if they can be shown to be reasonably necessary.

(3) *The Construction of New Roads.*—There are already a large number of new roads and by-pass roads contemplated throughout the country. These schemes could be pushed forward, and the necessary arrangements made with landowners and others so that the schemes may be ready when the necessity arises. Here, again, the Road Board are willing and anxious to assist with free grants. No doubt many far-seeing and patriotic landowners would willingly give their land for the purpose, or would agree to sell at very low rates. If they held out for exorbitant prices they would be subject to adverse public opinion.

(4) *Town Planning.*—There are several schemes which have received the consent of the Local Government Board, and others might be speedily proceeded with so as to be ready in good time. It is evident that such schemes, especially if on a large scale, would involve the construction of long lengths of roads, streets, and sewers, and other works of considerable magnitude, as some of the undertakings must necessarily include considerable excavation and filling in of the ground, a work in which large numbers of unskilled labour could usefully be employed

(5) *Laying Out Estates.*—Private owners and [illegible] lay out building estates might be assisted by the local authorities in some mutually satisfactory arrangement by which the roads, sewers, &c., could be constructed by the local authority [illegible] assisted by the unemployed.

(6) [illegible] Village [illegible] the Public Health Act, 1875, or the Private Street Works Act, 1892, [illegible] reasons, it would be possible to make use of the best of the men in work of this description, and so make room for other unskilled men elsewhere.

(7) [illegible] this year there is always a general staff employed in such work, but this could be somewhat augmented if found necessary, and there is no doubt that many of our streets and roads could be better dealt with in this [illegible] to add that in times of snowfalls there is always an almost limitless scope for the employment of unskilled labour.

(8) [illegible] In [illegible] this country there are large heaps of dumped house refuse. These could be removed and the material dug into the land, even if the heaps were on private property. Such a work as this would employ very large numbers of unskilled labour, and would be a [illegible] not only in removing an existing nuisance, but also in improving lands for agricultural purposes.

(9) [illegible] Where there are [illegible] sewage disposal works with tanks and bacteria beds, work might be found, where necessary, for the removal, washing and replacement of the filtering material, or where extensions were contemplated these might be pushed forward. Where there are sewage farms or land treatment, a great deal of work might be carried out in digging, filling in, and in many useful directions. Where the land is of a stiff or clayey nature it could be greatly improved by digging in house refuse, which could thus be utilised under No. 8 of these suggestions. In many low-lying sewage farms the levels might be improved by filling in, and there is no doubt whatever that a very large amount of unskilled labour could be employed in useful work at a large number of our sewage disposal works.

(10) *Street Tree Planting.*—Although this work would not employ a very large number of unskilled men, it would find employment for some of them. If the time of year was not the right one for tree planting, the holes might be prepared and filled in ready for the proper season.

(11) *Public Parks and Pleasure Grounds.*—There is often a large amount of work necessary in excavating, filling in, levelling, &c., in public parks. In some cases, artificial lakes and ponds are required. There are many other works in such places which would give employment to large bodies of unskilled labour.

(12) *Filling in Disused Quarries.*—In many localities there are disused quarries, pits and depressions of various kinds. Arrangements could be made for filling these in if suitable materials could be found for the purpose. There are many cases where the owners of such pits or quarries would be only too willing to allow them to be filled in, especially if they could be converted into suitable building sites.

(13) *Stone Breaking.*—This work was at one time largely done by hand, and employed a considerable number of persons. It is specially suitable for unskilled labour, but has become unpopular for obvious reasons. However, "needs must when the devil drives," and no doubt anyone would rather break stones than starve, and it is a work that is especially useful and easy of application in time of real distress.

Turning now to more general and larger national works in which very large numbers of unskilled labour could be employed, the following are suggested:—

(14) *Derelict Canals.*—In this country there are many miles of canals which are of no use to anyone. Many of these are almost dry, or, where they have water in them, are overgrown with aquatic weeds. There are several ways in which these useless canals could be dealt with—viz., (*a*) They could be drained and remodelled so as to be made into electric power driven light railways if the route was sufficiently important for this purpose; (*b*) they could be made into ordinary roadways; (*c*) they could be filled in, and the land either used as a road or thrown into agricultural land. Such work as this would give employment to a very [illegible] number of men.

(15) *Sea Defences.*—On many of our coasts the sea is making more or less rapid inroads. The preservation of land at many of these places is a national question, and the necessary works of preservation of our shores would involve large works of varying nature in which considerable numbers of men could be employed.

(16) *Land Reclamation.*—There are a vast number of estuaries and marsh lands which could be reclaimed from the sea. The Development Commissioners have funds at their disposal for this useful work, and there are many schemes of this description which, from the nature of such work, could employ many hundreds of men.

(17) *Forestry.*—The planting of forest trees on a large scale might usefully be undertaken in various parts of the country.

(18) *Land Cultivation.*—The drainage and improvement of waste lands so as to bring them under cultivation could also be carried out.

(19) *Military Purposes Work.*—If it [illegible] necessary to carry out further earthworks, &c., in many of our already fortified positions and elsewhere. Could not civil labour be largely employed in these works, and thus allow the military free scope for other duties?

The above suggestions can no doubt be supplemented by surveyors and others who have a local knowledge of the requirements of their own districts; but we have ventured to set forth the above as they may assist in indicating the lines on which works suitable for unskilled labour might usefully be employed.

LOCAL AUTHORITIES AND THE WAR.

The Metropolitan Asylums Board have decided to carry out forthwith building works to the value of nearly £200,000.

The city engineer of Bristol, Mr. L. S. McKenzie, has prepared a list of useful works which could be put in hand to relieve distress.

The sanitary inspector, Mr. Leonard Bell, having joined his regiment, the Westhampnett Rural District Council have decided to keep his place open for him.

Morpeth Town Council have agreed that families of Reservists in corporation property will not be charged rental while the Reservists are on military duty.

Marylebone Borough Council will make up the full remuneration of officers and workmen on active service, and reinstate them on their return to their former position.

At the Carlton Urban District Council the widening of Burton-road and the improvement of the recreation grounds were mentioned as relief works for the unemployed.

Sunderland Corporation have agreed that all employees called upon to do naval or military duty shall be paid the difference between their military pay and their salary.

Bermondsey Borough Council have adopted a resolution to supplement the Army and Navy pay of employees to the full amount of their wages until the end of the war.

Paddington Borough Council have resolved to supplement the Government pay of officers and employees engaged on military service by an amount equivalent to the full pay of the men concerned.

Besides the 100 families of the Liverpool health department men and of minor officials, there are dependents of about 220 police officers and 250 tramwaymen to be placed on the pay lists while the war lasts.

Cumberland County Council have adopted a resolution that in all cases where servants of the council are on active service their pay shall be made equal to their regular wages, and their positions retained for them.

It was stated at the meeting of the Wolverhampton Town Council that the situations of all the municipal employees who had rejoined the colours would be kept open, and that the Government separation allowance had been doubled.

No fewer than 360 men in the employment of the Tramways Committee of the Birmingham Corporation have gone to the front. A scheme of allowances for their dependents is recommended for the approval of the General Purposes Committee.

The borough surveyor of Lewisham, Mr. E. Van [illegible]

[illegible]

[illegible] public works they might have in hand. The clerk said [illegible]

[illegible]

[illegible] service.

The East Sussex County Council have agreed that all employees in receipt of £100 a year who have [illegible] shall be dealt with separately.

Wrexham Town Council have authorised the chairman of the Finance Committee to deal with the cases of any corporation employee who volunteered for service [illegible]

Coventry City Council, at their meeting next week, will be recommended by the General Purposes Committee to keep open the post of any employee of the corporation who goes on active service, and to pay the usual percentage of other employees' income, provided no payment be paid exceeding £[illegible] per week for each child under the age of sixteen years. The question of the payments are to be further considered later.

The Mess Rates Committee of the County Council have instructed the clerk to write the different local authorities stating that, in consequence of unemployment and the disorganisation of labour caused by the war, the committee would welcome schemes for improvements of roads in such districts as were mostly affected. The suggestion was made that the scheme for making the proposed new Mevagissey road should be revised. The estimated cost of this is £[illegible]

The West Riding County Council are [illegible] to adopt the measures suggested by the Local Government Board for dealing with any distress which may arise in consequence of the war. The council have compiled a list of works relating to the construction and widening of bridges, the strengthening of road surfaces, drainage works, and the improvement of road corners, which will be brought before a committee to be convened at once with the view to grants-in-aid being obtained from the Road Board.

In order to provide work for men during the coming winter the Rhyl Urban District Council have passed plans for their new amphitheatre to cost £4,000, and have instructed the surveyor, Mr. A. A. Goodall, to prepare at once a full scheme of promenade improvements, while the plans for the new pier are to be submitted to a marine expert, so that this work also can be undertaken at an early date. An intimation has been received from the Local Government Board that they will facilitate all work for which loans are required. The board also sent an intimation that they will not require to hold an inquiry as to the council's application for a loan of £620 for additions to the isolation hospital.

As a result of action by the Distress Committee, who have been considering schemes of work in the event of serious lack of employment, several proposals for road and building works, involving an estimated expenditure of £15,278, were submitted to a special meeting of the Willesden Urban District Council. It was proposed that a deputation should attend at the Road Board, and had been impressed with the desirability of having [illegible] the largest of the earliest possible moment schemes of road repair. They had [illegible] the council to any expenditure but [illegible] the Road Board. The [illegible] were referred to the Works Committee.

With a view of finding employment at the present time the Middlesex County Council have decided to carry out at the earliest possible date, and as far as possible by direct labour, works which together will involve an expenditure of considerably over half a million sterling. They will include the preliminary work on construction of the Great West road and the new sanatorium for tuberculous patients near Southend. It was further agreed that extensive works of road improvement should also be put in hand. In view of the urgency of the matter, Mr. H. T. Wakelam, the county engineer, voluntarily returned from his holidays last week. All members of the staff who are called up for active service are to be paid full salaries, less the Army and Navy allowance.

The chairman of the Farnworth Urban District Council said at the council meeting recently that if the council proceeded at once with the laying out of Darley Hall estate, the time was opportune to find work for those who would be thrown out of employment by the war. Their surveyor, Mr. Lomax, had been working this and had put in motion out the proposed plans, which would be laid before the whole council. He thought it would be advisable for two or three delegates to be appointed to interview the Local Government Board, so that no delay might arise as to the sanctioning of the necessary loan. The plans included the banking up of the Crompton Lodge so as to convert it into a shallow boating lake. The council were unanimously in favour of the scheme, and it was decided to meet on the site itself.

Among the many Government departments and agencies that will be active in relieving distress by creating employment, the Road Board is destined to be conspicuous. Sir George Gibb, its chairman, has been criticised for not spending the whole of the [illegible] income on laying new roads or widening and repairing old ones. He has preferred to feel his way, and the wisdom of his caution (says the *Daily Mail*) has not only justified itself as a matter of policy, but will prove to have been a greater national service than he could possibly have anticipated. In the difficult times that lie before us, it is a subject for congratulation that the Road Board should have to its credit a surplus of £[illegible]. The Board does not propose to depart from the main principles that have hitherto shaped its action, but it does propose to apply those principles both more extensively and more speedily. Experience has convinced it that the most pressing and universal need is the strengthening and improvement of existing road surfaces and foundations and not the construction of new thoroughfares or, in general, the enlargement of old ones. It has [illegible] by highway authorities by grants and loans to the amount of over £2,600,000 on certain schemes that have had to do almost wholly with the improvement of road crusts. This line of action it intends to persevere in. It is encouraging all the highway authorities to submit plans for the betterment of the roads in their areas. In this way a large amount of necessary work will be put in hand.

Mr. W. P. Butterfield, director of W. P. Butterfield, Limited, galvanising works, Shipley, has been accepted for home service with his 30-40 h.p. Humber car, to assist with the requirements for the movements of the home Forces.

Nuneaton Housing Scheme. At a meeting of Nuneaton Town Council on Wednesday the Sanitary Committee recommended the purchase of 4,000 sq. yds. of land at Stockingford, and 6,000 yds. on the Central estate, Nuneaton, for the purpose of erecting municipal houses for the working classes. It was stated that the sites would provide for about eighty houses. Two classes of houses would be built, and the rents would be fixed at such a rate that there would be no loss to the ratepayers. The report was adopted.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Birmingham T.C. (August 5th. Mr. A. W. Brightmore.)—£31,612 for works of paving in Harborne-road and High-street, Harborne; Ryland-street and Ledsam-street, in the city, and Booth-street, Handsworth. £10,078 for the improvement of Redding-lane, Shattsmoor-lane, Formans-road, and Weston-lane, and £5,910 for works of sewerage and surface-water drainage.—Detailed evidence with respect to the road works was given by the surveyor, and it was stated that the sewerage and surface-water drainage operations were for Hall Green, which was a rapidly developing district. It was stated that the sewerage loan should be for a term of thirty years.

Dewsbury T.C. (August 5th. Mr. Edgar Dudley).—£500 for the purchase of land for the widening of Old Westgate, and £1,300 for the acquisition of Earlsheaton Hall estate for the purpose of a public park. It was stated that the price to be paid for the land for the proposed park was £166 per acre. The inspector, in the course of the inquiry, stated that it did not seem that the council knew what they were going to do with the house it was proposed to buy, or what land it was intended to take. There was no map or anything in writing with the vendors.

Esher and the Dittons U.D.C. (August 10th. Mr. F. H. Tullochs.)—£580 to carry out certain sewerage works on a piece of land between Thames Ditton Railway Station and Esher-lane. Mr. J. T. Metcalf, the clerk, said the area of the district was 5,978 acres, the population was estimated at 13,000, and the assessable value £129,971. A penny rate produced £541. The council had accepted provisionally a tender of £630 for the work, and would pay out of revenue the difference between the £580 to be borrowed and the amount of the tender. Mr. H. C. Fread, the surveyor, who submitted plans, said the proposal was for a separate system for sewerage only, and the cost of not putting in surface drainage was £60. These letters, and the cost of road widening, would be met out of revenue. There was no opposition.

APPLICATIONS FOR LOANS.

Aylesbury U.D.C.—£270 for the drainage of the cemetery.

Burton-on-Trent T.C. £30,000 for the duplication of the sewage rising main.

Bolton T.C.—£64,000 for working-class houses and £1,000 for new streets.

Dover T.C. £500 for electrical services.

Harrogate T.C.—£1,700 for baths extension.

Lytham U.D.C. £1,280 for private street works.

St. Thomas R.D.C.—£5,500 for works of water supply.

Seaton U.D.C.—£1,050 for drainage extensions.

Swanage U.D.C. £1,000 for waste preventing and other machinery at the waterworks.

Woodford U.D.C. £1,098 for wood block paving.

Yarmouth T.C.—£1,600 for cemetery extension and the construction of a lodge, and £5,000 for paving works in connection with the pickling plots.

LOANS SANCTIONED.

Braintree R.D.C. £1,100 for the erection of cottages.

Clones U.D.C. £2,700 for sewerage works.

Frinton U.D.C.—£2,350 for the purchase of property for use as public offices and the provision of a town yard.

Gosport and Alverstoke U.D.C. £2,710 for alterations at the Hard.

Gravesend T.C.—£1,615 for street works.

Hove T.C.—£3,750 for the construction of a bridge in Sackville-road.

Littlehampton U.D.C.—£1,000 for the improvement of High-street and Terminus-road.

Runcorn R.D.C. £110 for works of sewerage.

Westhampnett R.D.C. £300 for the purchase of land (repayable in eight years) and £1,030 (repayable in sixty years) for the erection of workmen's cottages at Boxstad.

Weybridge U.D.C.—£800 for widening Byfleet-road.

FORTHCOMING INQUIRIES.

AUGUST.	£
24.—**Colchester.** For paving works (Mr. F. H. Tulloch)	8,325
24.—**Harwich.** For a housing scheme (Mr. H. C. Chapman)	2,140
24. **Southampton.** For the purpose of a housing scheme (Mr. W. H. Collin) ...	11,923
24. **Uxbridge.** For a housing scheme (Mr. H. S. Stewart)	7,000
25.—**Bispham.** For road improvement (Mr. A. G. Drury)	1,805
25.—**Blean.** For works of sewerage (Mr. F. O. Stanford)	820
25.—**Chesterton.** For a housing scheme (Mr. H. A. Chapman)	650
25. **Portland.** For the purpose of council offices (Mr. W. O. E. Meade King)	5,167
25. **Rugby.** For works of sewage disposal (Mr. W. M. Cross)	470
25. **Southampton.** For works of water supply (Mr. R. G. Hetherington)	36,500
25. **Sutton Bridge.** For a housing scheme (Mr. C. H. Eyles)	2,030
25.—**Wayland.** For a housing scheme (Mr. Edward Leonard)	375
25. **Widnes.** For the erection of a refuse destructor (Major J. Stewart)	6,300
25. **Wincanton.** For a housing scheme (Mr. W. H. Collin)	2,425
26. **Blackwell.** For a housing scheme (Mr. C. H. Eyles)	20,000
26. **Cardiff.** For the purpose of electric lighting (Mr. H. Shelford Bidwell)	1,650
26. **Chelmsford.** For works of sewage disposal (Mr. R. H. Bicknell)	1,750
26. **St. Neots.** For the purchase of the corn exchange (Mr. Edgar Dudley)	3,300
26.—**Sevenoaks.** For a housing scheme (Mr. H. S. Stewart)	2,000
26. **Sheerness.** For works of water supply (Mr. F. O. Stanford)	7,260
26. **Southend.** For works of road widening (Mr. R. H. Bicknell)	5,650
26. **Thakenham.** For works of water supply (Mr. R. G. Hetherington)	5,172
26.—**Torquay.** For street improvement (Mr. W. O. E. Meade King)	891
26. **Wakefield.** For road improvement (Major J. Stewart)	1,440
26. **Wigan.** For baths extension (Mr. A. G. Drury)	3,726
27.—**Bishop Stortford.** For road improvement (Mr. Edgar Dudley)	5,000
27.—**Godstone.** For works of sewerage (Mr. F. O. Stanford)	560
27.—**Ince-in-Makerfield.** For works of sewage disposal (Mr. A. G. Drury)	17,500
27. **Lichfield.** For sewerage and sewage disposal works (Mr. W. M. Cross)... ...	1,930
27.—**Llanidloes.** For the purchase of the gas works (Major C. E. Norton)	—
27. **Neath.** For works of sewerage (Mr. H. Shelford Bidwell)	183
27.—**Salcombe.** For the purchase of the council hall (Mr. W. O. E. Meade King)	300
27.—**Shipley.** For the provision of a refuse tip (Major J. Stewart)	1,800
27.—**Southgate.** For road construction (Mr. M. K. North	600
28.—**Aberystwyth.** For works of sewage disposal (Major C. E. Norton)	30,000
28.—**Chester.** For works of sewage disposal (Mr. W. M. Cross)	6,500
28.—**Northwich.** For the erection of public baths (Mr. A. G. Drury)	3,100
28. **Rhondda.** For works of sewerage (Mr. H. Shelford Bidwell)	17,000
28. **Wandsworth.** For the construction of underground conveniences (Mr. F. O. Stanford)	6,257
28 **Wembley.** For the provision of a burial ground (Mr. Edgar Dudley)	2,200
29. **Williton.** For works of water supply (Mr. W. O. E. Meade King)	950
TOWN PLANNING.	
SEPTEMBER.	
8.—**Rochdale.** (Mr. George L. Pepler)	—

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

[illegible] Buildings—Cambridge; housing and town planning—Clydebank; refuse collection and disposal—Hove; roads and materials—Bristol £17,500, Goole £20,000, Hammersmith £18,725, Littlehampton, Winchester; [illegible] Ashton-under-Lyne, [illegible] £44,000, water gas and electricity—Cardiff £20,000.—Particulars of other works proposed [illegible] "Local Government Board Localities" page.

BUILDINGS.

Alnwick U.D.C. An additional public convenience is to be provided at an estimated cost of £350.

Blackburn T.C.—A scheme has been approved for the [illegible] of new electricity works.

Cambridge T.C. It is proposed to establish [illegible] baths, [illegible] and a lodging-house [illegible] in Sturbridge-road at an estimated cost of £1,[illegible].

Hove T.C. The borough surveyor, Mr. H. H. Scott, has prepared the plan for a public convenience [illegible] £430.

Oxford T.C. A special committee has been appointed to consider the building by-laws "with the object of modifying them and making them less stringent, so as to reduce the cost of building cottage [illegible]."

Wallsend T.C.—The borough surveyor, Mr. G. Hall[illegible] has [illegible] the extension of the [illegible].

Westhampnett R.D.C. The clerk reports that plans for the reconstruction of the canal bridges at Birdham and [illegible] have been approved by the [illegible] Town Council, and would be submitted to the Westhampnett Council after they had been approved by the county authority. The cost is estimated at £1,000 each bridge.

HOUSING AND TOWN PLANNING.

Clydebank T.C.—The provision of workmen's dwellings is under the consideration of the council.

Easington R.D.C.—Negotiations are in progress for the purchase of land at Shotton for the erection of [illegible]

Midhurst R.D.C.—A letter has been received from the Local Government Board as to the application of the council to borrow £780 for the erection of workmen's houses at Milland approving generally of the proposals, subject to a satisfactory water supply being secured, and suggesting certain amendments of detail in the proposed houses.

PARKS AND OPEN SPACES.

Glasgow T.C.—The question is under consideration of providing a winter garden in Kelvingrove Park [illegible]

Southgate U.D.C.—It is proposed to carry out extensive improvements at Broomfield Park, including draining and levelling (estimated to cost £600), the construction of a bowling green (£525), construction of dwarf wall with iron railings (£887), construction of gravelled path (£185), and the [illegible] of four additional tennis courts (£240).

REFUSE COLLECTION AND DISPOSAL.

Chard T.C.—The council have adopted the proposal of the borough surveyor, Mr. E. W. Heard, for an improvement of the system of refuse collection.

Chester-le-Street R.D.C.—Particulars have been submitted from other districts of the cost of taking house refuse to sea, and the inspector and clerk have received instructions to prepare a schedule showing the cost per ton in other districts, together with the estimated cost for the parishes of Pelton and Urpeth.—For scavenging purposes the Western division has been divided into two divisions, to be known as the middle and western divisions, and comprising 323 and 334 houses or thereabouts respectively.

Hove T.C.—The council have adopted a report by the Sanitary Committee recommending that refuse should be collected twice a week during the summer six months, and once a week during the rest of the year, while collections all the year round should be made twice a week at the larger establishments; that application be made to the Local Government Board to borrow £5,000 to cover the estimated cost of providing three additional crushing machines; and that agreement for five years be made with Mr. C. W. Reynolds of Hove, to take the whole of the crushed refuse at the rate of 1½d. per ton.

ROADS AND MATERIALS.

Bristol T.C.—The borough engineer, Mr. L. S. McKenzie, has submitted to the Sanitary Committee a list of roads in which improvements were desirable, and of other work, the total estimated cost being £17,500. The committee agreed to apply to the Road Board for a contribution towards the cost of the works.

Cheshire C.C.—Fencing and road works estimated to cost £270 are to be undertaken in connection with the reconstruction of Beeston Bridge.

Cumberland C.C.—The Highways Committee have received authority to proceed with the scheme of road improvement at Distington and Dub Mill, at an estimated cost of £585.

Durham C.C.—The construction of a road from Ludworth to Haswell Plough, at an estimated cost of £1,750, is under consideration.

East and West Molesey U.D.C.—The Local Government Board, writing with reference to the council's letter stating that they did not consider the arterial road scheme for Greater London affected the Molesey area, asked the council to reconsider the matter, and forward replies to the questions which had been asked of local authorities by the board. The chairman (Mr. J. Ray) said he thought the council ought to be extremely careful, or they would be burdened with some heavy expenditure for improvements. The council eventually decided to give the desired information, and recommended that the Bridge-road from Hampton Court Bridge to the boundary, Walton-road, and Hurst-road, be mentioned as the principal connecting roads that might be widened to advantage in the district.

East Stow R.D.C.—The surveyor, Mr. G. Harrison, has received instructions to prepare plans for making up Victoria-road.

Evesham R.D.C.—The council have accepted the offer of the county council to contribute £200 towards the cost of widening and improving the road at the Waterside.

Goole U.D.C.—A committee is considering a scheme for the construction of a road from Cottingham-street to a point near Thorne Colliery, at an estimated cost of £20,000.

Grimsby T.C.—The Road Board have promised a subsidy of £5,000 towards the Weelsby-road improvement, conditional upon the work being undertaken without delay.

Hammersmith B.C.—The council have approved a scheme of road improvements, estimated to cost £18,725.

Littlehampton U.D.C.—The council are inviting tenders for 750 tons of 1½-in. broken granite, 150 tons of ¼-in. granite chips, 250 tons of shellicks, 10,000 gallons of distilled tar, 5,000 gallons of raw tar, steam rolling, and scarifying.

Lynn T.C.—A scheme for widening the High-street is being carried out.

Northwich R.D.C.—It has been decided to make up Sandy-lane, Weston Point, at an estimated cost of £670.

Rhyl U.D.C.—An intimation has been received from the Road Board that the scheme for a new road from Rhyl to Prestatyn and Gronant, if proceeded with at once, will have the support of the board. On Friday last, as the result of a conference between this council and the other authorities concerned, it was agreed that the project be carried out, and to press upon the Prestatyn council the desirability of supporting the scheme. The estimated cost is £26,000.—The surveyor, Mr. A. A. Goodall, has received instructions to prepare a scheme at once for the laying-out

of the portion of the foreshore lying between the pier and the Marine Gardens. The scheme will utilise the sands adjacent to the promenade, but there will be ample tide-cleansed sands some 50 yds. seawards for the recreation of the children.

Sunderland T.C.—It is proposed to construct a cement footpath with granite kerb in Roker Park-road, at an estimated cost of £324.—It is proposed to pave West Park Fawcett-street with Durax stone, at an estimated cost of £423, and construct a footpath at a cost of £120.

Wilts C.C.—The council have received from the Road Board a cheque for £9,000 on account of the work now proceeding on the London Bath road.—The Roads and Bridges Committee are considering a proposal of the county surveyor, Mr. J. G. Powell, that the council should retain and supervise the whole of the main roads now repaired by contract by the rural district councils.

Winchester T.C.—The council have approved the proposal of the county council to lay wood block paving on the Winchester and Southampton main road. The county council's share of the cost will be £2,680, and the corporation's £350.

SEWERAGE AND SEWAGE DISPOSAL.

Ashton-under-Lyne T.C.—A scheme for the extension of the Plantation Farm sewage disposal works is to be carried out, at an estimated cost of £14,200.

Cockermouth R.D.C.—Consideration is being given to proposals by the Local Government Board for schemes of sewerage in Rosthwaite and Broughton Moor.

Congleton R.D.C.—The new sewerage scheme for Thurlwood is to be carried out at an estimated cost of £2,134.

Foleshill R.D.C.—The surveyor, Mr. A. E. Newey, has submitted plans, which have been approved by the council, for two detritus tanks, screening chambers, and sludge lagoons, at an estimated cost of £584.

Great Ouseburn R.D.C.—The council have requested Mr. E. J. Silcock, M.INST.C.E., of Westminster and Leeds, to report upon the sewerage and sewage disposal of Acomb.

Helston T.C.—The council have instructed Mr. A. P. I. Cotterell, M.INST.C.E., of Westminster, to prepare a scheme of sewerage and sewage disposal for their existing municipal area, and for the areas about to be added to it.

Nuneaton T.C.—Proposals are under consideration for the construction of foul sewers, at an estimated cost of £2,500, and of storm-water sewers, at an estimated cost of £650.

Swansea T.C.—The council have adopted a report of Mr. Midgley Taylor for a comprehensive drainage scheme in conjunction with the borough extension, estimated to cost £344,000. The borough engineer (Mr. R. H. Wyrill) explained the difference between this and the last drainage scheme that was proposed and defeated in Parliament. The outlet is still to be at the Mumbles Head, but from 100 yds. to 150 yds. further out to sea. The storage chamber is to be increased to double the size, which will give six times the dilution of the dry-weather flow instead of three, and thus enable the sewage to be stored the whole time instead of turning it out at doubtful hours. The gradient of the sewer is to be steeper by 18 in., proposed to be done by lowering the depth at the Mumbles by 1 ft., and raising the level at Swansea to 6 in. At Brynmill there is to be a 24-in. storm-water overflow pipe extending down to low-water mark and passing under the Brynmill stream, with a syphon affixed here and also another at Blackpill. Then it is proposed to come forward with the main sewer on the old line so far as Sketty-road, whence it is to be extended so as to embrace Morriston and Llansamlet. Then it is to be brought across the river near the Duffryn works, at which point there is to be a pumping station, as the main sewer here is at a higher level. As regards the east side, a pipe is to be laid from the end of the borough boundary from the Vale of Neath Arms, where the sewage will gravitate towards a pumping station near St. Thomas, and then be pumped along Pentreguinea-road under the river into the main sewer. At Pontardawe there will be a storm-water overflow at Ynisgeiro.

Westhampnett R.D.C.—Plans have been completed for the extension of sewers at Feltham, at an estimated cost of £384.

WATER, GAS, AND ELECTRICITY.

Cardiff T.C.—A scheme has been adopted by the Waterworks Committee, subject to the approval of the Local Government Board, for the construction of a new service reservoir and filters at Heath, at an estimated cost of £20,000.

Chard T.C.—A letter has been received from the Local Government Board notifying that the period for the repayment of the loan for the water scheme would be sixty years for the loan and legal expenses, and thirty years for the sum required for works.

Colchester T.C.—It has been agreed to lay a new main from the water tower to the cattle market, at a cost of £475, and to replace enlarged mains, at an estimated cost of £1,500.

Devizes T.C.—Proposals have been made for the installation of improved plant at the gasworks.

Doncaster R.D.C.—It has been decided to open negotiations with the Doncaster Corporation with a view to a joint scheme of water supply for the whole rural area.

Grantham R.D.C.—A committee has been appointed to prepare a scheme of water supply for the village of Barrowby.

Larne R.D.C.—A scheme has been approved for an improved water supply for Glenarm.

Lathom and Burscough (Lancs) U.D.C.—Works of water supply are to be carried out, at an estimated cost of £800.

South Shields T.C.—The municipal electricity undertaking earned, during the last financial year, a nett profit of £3,522, the largest on record.

MISCELLANEOUS.

Harrogate T.C.—The question is being considered of mechanical haulage for the electricity, highways, and health departments.

Southgate U.D.C.—The surveyor, Mr. C. G. Palmer, has submitted a list of the council's workmen with a view to the adoption of a pension scheme.

THE LATE MR. W. G. KIRKALDY.

A published list of some recently proved wills includes that of the late Mr. William George Kirkaldy, 99 Southwark-street, S.E., and 25 Aberdare-gardens, N.W., civil engineer, and head of the well-known testing and experimenting firm. The deceased gentleman, son of the late David Kirkaldy, was born in Glasgow in 1862, and educated at University College School. On coming of age he entered into partnership with his father, thus forming the firm of David Kirkaldy & Son. Mr. W. G. Kirkaldy was an associate member of the Institution of Civil Engineers, and was awarded the Telford Premium for a paper on "Steel Rails" read before the institution in conjunction with the late Sir William Roberts Austen. He was also a member of the Iron and Steel Institute, the Royal Institution, the International Association for Testing Material, the Society of Arts, the Concrete Institute, and the Court of the Worshipful Company of Turners.

At the annual meeting of the Incorporated Association of Municipal and County Engineers held in London towards the end of June, 1909, Mr. Kirkaldy presented a comprehensive and carefully prepared paper entitled "Notes Regarding the Testing of Materials," which was afterwards published in THE SURVEYOR on July 30, 1909. In connection with the above-mentioned meeting of the association, a visit was paid by members to Messrs. Kirkaldy's testing and experimental works in Southwark-street. Here many important tests are carried out, dealing with a great variety of materials, such as wood, iron, steel, bronze, wires, stone, bricks, drain pipes, cement, ferro-concrete, and even sash-cords and ropes. The spacious upper floor of the works is devoted to an interesting and well-arranged museum of materials tested. Most of the tests are doubtless precautionary measures to serve as guides in the choice of material before using. Some of them, however, have been carried out to ascertain the cause of disasters that have occurred, and the museum includes among its melancholy mementoes of such disasters a portion of the ill-fated Tay Bridge and a piece of the collapsed roof of Charing Cross Railway Station.

PERSONAL.

Mr. G. Bell, borough engineer of Swansea, who has resigned, will act as consulting surveyor.

Mr. R. Argyle has been appointed inspector of roads and streets under the Aberdeen Town Council, at a salary of £200 per annum.

Mr. J. T. Wilson, surveyor to the Oakengates Urban District Council, has sent in his resignation, and will be succeeded by Mr. V. Wilson.

Mr. G. J. Edmundson, surveyor and inspector to the Stourport Urban District Council, has had his salary advanced to £100 a year.

Mr. A. J. Price, surveyor to the Lytham Urban District Council, and consulting, has been appointed to visit Southport and inspect the improvements on the foreshore.

Mr. Frank Stallard, [illegible] the City of Lincoln, has been granted further three months' leave of absence on account of ill health.

Mr. J. R. Sisterson, senior surveyor to the Hartley Wintney Rural District Council, having expressed a desire to retire, the council have agreed that he shall do so at the end of the year. He has served in the service of the council for thirty-three years.

Mr. Harold Cordon, second son of Mr. R. C. Cordon, of Belper, has been appointed surveyor to the Freebridge Rural District Council, Norfolk. Mr. Cordon, jun., has hitherto assisted his father in his work as surveyor to the Belper Rural District Council.

Mr. L. D. Thompson, deputy county surveyor of Lancashire, has been appointed county surveyor of Cornwall in succession to Mr. A. E. Brookes, who is proceeding to Durham. There were sixty applicants. Mr. Thompson will receive a salary of £600, rising to £700 per annum.

Mr. C. T. Chadwick, assistant borough surveyor of Maidenhead, has been unanimously appointed surveyor of public works and highways to the Faringdon Rural District Council. The Maidenhead Corporation increased Mr. Chadwick's salary in June last by £10 per annum, with two further annual increases of £5 each, being the third increase he has received during his service under the corporation.

SALFORD BOROUGH ENGINEERSHIP.

The Salford Corporation on Wednesday authorised the publication of advertisements inviting applications for the position of borough engineer at a salary of £900 per annum, rising by biennial advances of £100 to a maximum of £1,100.

Claridge's Asphalt is being used on the new buildings of the Institute of Chemistry, Russell-square, W.C.

Important Manchester Schemes.—The Town-planning Committee of the Manchester Corporation, at a meeting on Tuesday, had before them a report by the city surveyor, Mr. T. de Courcy Meade, with respect to certain important schemes. The matter was further considered on Wednesday by the Improvement Committee by whom the report was approved. It is proposed that a new road, 8,205 yds. long and 80 ft. wide, should be constructed between Slade-lane and Cheadle and Gatley, at an estimated cost, if it is made 80 ft. wide, of £171,647. The Withington Committee approved the scheme on Wednesday, so that all the authorities concerned in the matter are agreed. The Parks Committee also propose to make lakes in three parks.

FOR OTHER ADVERTISEMENTS

See End of Paper.

RURAL DISTRICT OF BUCKLOW HUSHIRES.

The Council invite applications for the post of Working Highway Surveyor. Salary after the rate of £175 per annum, increasing by yearly increment of £5 to a maximum of £200 per annum, with an allowance of £30 per annum for travelling expenses, such allowance being made only on the express condition that such travelling within the District in the discharge of his duties is done by means of Motor Traction—*e.g.*, motor car or motor cycle. The person appointed will be required to devote the whole of his time to the duties of the Office of Highway Surveyor of the Bucklow Rural District, which comprises 30 Contributory Places of a total area of 55,916 Statute Acres, and containing 207 miles of District Roads, and to provide a guarantee Fidelity Bond with an approved company or society in the sum of £200. He must reside, and the Council will provide an office for him, in or near Knutsford, at a cost not exceeding £15 per annum, or make an allowance to him of that sum for approved accommodation.

The appointment will be determinable by three months' notice on either side at any time.

Applicants must not exceed 35 years in age.

They must have had practical experience in connection with the making, repair and maintenance of highways and matters cognate thereto, and must be thoroughly competent to keep the necessary Books and Accounts, draw plans, prepare estimates and specifications, supervise the making of new roads and bridges, and perform all the duties of a Surveyor of Highways, and will be required to do so. Preference will be given to applicants who are now Highway Surveyors or Assistants.

Applications, marked "Highway Surveyor," must be in the candidate's own handwriting, must state age and full particulars of qualifications and experience, accompanied by copies of not more than three testimonials of recent date, and must reach me not later than morning's post on Wednesday, the 2nd September, 1914.

Any candidates selected to appear before the Council on the 16th September will be communicated with prior to that date.

Canvassing will disqualify candidates, though it is permissible to send particulars of application and copy of testimonials to each Member of the Council.

GEORGE LEIGH,
Clerk to the Bucklow Rural District Council

Union Offices, Knutsford.
August 19, 1914.

N.B.—The Council have a Consulting Surveyor.

(1,865)

BOROUGH OF MAIDENHEAD.
SURVEYOR'S ASSISTANT.

Applications are invited for the position of Assistant in the Borough Surveyor's Office at a salary of £80 per annum, rising by £5 per annum to £100 per annum.

Candidates must have received a thorough training in a Municipal Office, and be experienced in the general routine of a Borough Surveyor's Department.

They must be competent to keep the Wages Books, Stores and other Accounts, and should have a fair knowledge of Surveying, Levelling, and Building Construction.

Applications, in candidate's own handwriting, together with copies of not more than three recent testimonials, and endorsed "Surveyor's Assistant," should be delivered to the undersigned by 4 p.m. on Wednesday, the 2nd September, 1914.

H. E. DAVIES,
Town Clerk.

Guildhall, Maidenhead.
August 19, 1914. (1,866)

FARINGDON RURAL DISTRICT COUNCIL.
PARISH OF LONGWORTH.
WORKS OF SEWERAGE.

Tenders are invited for Supplying and Laying about 700 yds. of 9-in. Glazed Stoneware Socket-pipe Sewer, at Longworth.

Specifications, Plans and particulars may be seen, by appointment, at my Office, London-street, Faringdon, Berks. Sealed Tenders, endorsed "Sewer," must reach the office of Alan G. Haines, Esq., Clerk to the Council, Faringdon, Berks, not later than the first post Tuesday, 8th September, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. GLYNN WARNE.
Engineer.

Faringdon, Berks.
August 19, 1914 (1,867)

INSTITUTION OF MECHANICAL ENGINEERS.

PARIS MEETING.

(From our Special Representative.)

[illegible] the annual meeting of the [illegible] Institution of Mechanical Engineers during [illegible] was held last month in Paris. [illegible] in conjunction with the Société des Ingénieurs Civils de France, Mr. William Hanning, M.I.Mech.E., President of the British Chamber of Commerce in Paris, Mr. Angus Buchanan, British Vice-Consul at Calais, and others, and the Institution Society had only been then well-appointed [illegible] for the purpose of meetings, but also provided members and their [illegible] the library and reading room during the continuance of the meeting. In addition [illegible] the reading and discussion of papers, the proceedings included [illegible] visits to halls of [illegible] and other places of [illegible] interest in Paris and Northern France, and [illegible] Business connected with [illegible] on Tuesday, April 7th, with the President, Mr. [illegible], presiding, who officiated in the unavoidable absence of Sir Frederick Donaldson, K.C.B., the president, and the council and members [illegible] Mr. Henry Gall and the council [illegible] Civils in the meeting hall of the society. After the reading and discussion of papers visits were made to the works of MM. Darcy & Cie., Suresnes; the Etablissements Baudet & Donon, Argenteuil; MM. Brown Boveri & Alioth, Le Bourget, and to the Conservatoire National des Arts et Métiers. The evening of the same day was allotted to the institution dinner at the Hotel Continental.

On Wednesday the reading of papers was commenced, and in the course of the afternoon visits were paid to the works of MM. J. & A. Niclausse, Paris, the works of MM. Hotchkiss & Cie, and of the Société Anonyme des Etablissements Delaunay Belleville, both at St. Denis, as well as to the works of the Société Generale de Constructions Mecaniques, and the Fonderies et Ateliers de la Courneuve, both at La Courneuve. Wednesday evening was devoted to a conversazione at the Société by invitation of the president, Mr. Henry Gall, Mrs. Gall, and the council of the society.

Members had a holiday from papers on Thursday, but many of them availed themselves of invitations to visit works in Paris and the neighbourhood. The afternoon was occupied by a reception in the Bois de Boulogne by Mr. William Hanning, M.I.Mech.E., President of the British Chamber of Commerce, and Mrs. Hanning, after which some members departed for an excursion to Valenciennes and others to Lille. At Valenciennes the following establishments were visited: The works of the Société de Construction de Locomotives de Blanc-Miserou, the Ateliers de Construction du Nord de la France, and the works of the Société Francaise de Constructions Mecaniques (Anciens Etablissements Cail). At Lille the following places of interest were visited: The works of the Compagnie Francaise Thomson-Houston, the locomotive and general engineering works of the Compagnie de Fives-Lille, the Roubaix and Tourcoing Multiple Filtration Plant, the Ecole Nationale des Arts Industriels, Roubaix, and various industrial establishments. The visits to Valenciennes and Lille occupied the whole of Friday, and terminated the official programme of the meeting.

Most of the papers read at the meeting were on subjects not appealing specially to municipal and county engineers, but two of them deserve more than passing mention in our columns. The first was on the

BALANCING OF INTERNAL COMBUSTION ENGINES,

by Mr. H. F. Fullagar, of Newcastle-on-Tyne, and communicated by Mr. William Hanning, of Paris.

The problem of balancing internal combustion engines is of considerable interest to those of our readers who may have to instal prime movers of this class in buildings for electric light and power pumping and other purposes. As a general rule the noise and vibration caused by internal combustion engines is inversely proportional to the degree in which the condition of perfect balance has been attained, and it is worthy of note that the balancing of such engines is much more difficult than the corresponding operation in connection with steam engines. In cases where the single-acting cylinder and trunk piston are adopted the crank angles are wider than with steam, and if several cylinders are employed vibration is caused by the greater length and flexibility of the crank case or framing. A further difficulty is due to the sudden and violent increase of pressure when the charge is fired by a spark, while firing by high compression gives rise to a severe reversal of torque in the crankshaft, and at the same time reversal of side thrust between the piston or crosshead and its guide.

After discussing the inertia forces to be balanced, and describing various types of engine more or less efficiently fulfilling the required conditions, the author drew the conclusion that the only type of engine construction in common use wherein balance of mass is completely, or almost completely, secured by the neutralisation among themselves of the inertia forces are the rotating engine, the engine with five and with six cylinders in line, and the four-cylinder two-stroke engine with cranks at right-angles one to another. Balance of mass alone is insufficient, however, because it does not counteract the violent fluctuation of pressure in the cylinders, and the resulting strains in the crankshaft and the engine frame. Therefore, to secure freedom from vibration it is necessary to arrange the cylinders in relation to the crankshaft in such manner that strains in the framing are either eliminated or so balance each other as to obviate the tendency to shift the centre of gravity of the engine relatively to its crankshaft and point of support. The author then described the Fullagar engine, which was stated to represent perfect balance of primary and secondary mass forces, balance of impulse, balance of torque, and balance of gyrostatic action.

The second paper was one on

IMPROVEMENTS IN MOTOR LORRIES,

by M. Eugene Brillié, of MM. Schneider & Cie, communicated by M. Peloux, of Paris, and taken as read.

The chief points of interest to our readers are those connected with a self-loading type of heavy lorry designed for the transport of materials which, in the first place, are stacked or deposited upon a detachable trolley, hauled up a tilting truck at the tail end of the lorry, and so brought into position on the chassis, the work of hauling being performed by means of a capstan worked by the motor of the lorry. Unloading can be effected rapidly by reversing the operations mentioned, and it is claimed that lorries of this type enable a great deal of time to be saved. Two men are necessary for loading and unloading—one to drive the motor and the other to attend to the manipulation of the trolley and auxiliaries.

Among the numerous visits arranged, those to which attention is directed in the following notes were of particular interest to municipal engineers.

CONSERVATOIRE NATIONALE DES ARTS ET MÉTIERS.

This important institution was established in 1794 for the collection of machines, models, drawings, books and documents relating to all arts and industries practised in France.

In addition to the collection of objects in the "Musee Industriel," as the first established part of the Conservatoire is now designated, public lectures were instituted in 1819 on science applied to industry, and the number of professors has been constantly increased, twenty-three series of evening lectures being delivered regularly during the winter season.

Several laboratories are included in the Conservatoire, where important work is done, a notable instance being the construction of metric standards for the countries using the metric system of weights and measures. The testing laboratory forms an annexe of the Conservatoire, and was founded in 1900. In it tests are made for the public on metals, building and other materials, fuels, oils and physical instruments. Electrical equipment is tested in a special laboratory.

COMPAGNIE ELECTRO-MECANIQUE WORKS.

The productions of these works are mainly devoted to the requirements of electric power stations. Since 1902 attention has been devoted to the manufacture of Parsons' steam turbines for driving dynamos. A most interesting installation at the works is the testing apparatus for steam turbines. The company pay great attention to the comfort of their workpeople; baths with hot and cold water are provided, as well as a well-appointed canteen with dining halls. There are also extensive gardens, divided up for the use of the workmen.

SOCIÉTÉ GÉNÉRALE DE CONSTRUCTIONS MÉCANIQUE.

The works of this company are well worth a visit, as will be gathered from the statement that the pro-

[illegible] of the firm include Corliss engines, fitted with Lentz valves, compound engines, Rateau steam turbines, centrifugal pumps, ventilators and air compressors, single and double acting [illegible] up to 2,000 horse power, Gobbe-Diesel engines, and refrigerating machinery.

THE CREPELLE ENGINE WORKS, LILLE.

Founded in 1848, the firm of Jean Crepelle & Co. claim to have been the first to introduce the Corliss engine into France. One of the largest installations of the Worthington pump operated by Corliss engines made by this firm is used for lifting and discharging into the sea the sewage waters of Rotterdam, the instalation having the high output of 240,000 cubic metres per day of twenty-four hours. The firm have recently completed for Paris a set of three pumps, designed to lift 30 cubic metres per second to a height of 295 ft.

LOMME-LES-LILLE POWER STATION.

This station, belonging to the Société Lilloise d'Eclairage Electrique, is equipped with forty-two [illegible] steam boilers, capable of evaporating a total of nearly 500,000 lb. of water per hour, a figure giving some idea of the extensive nature of the power station, which is [illegible] to municipal electrical engineers.

ROUBAIX AND TOURCOING FILTRATION PLANT.

The towns of Roubaix and Tourcoing have a double supply of water, that for drinking being obtained from springs in the neighbourhood of Douai. Water for industrial purposes is obtained from the river Lys, where it forms the frontier between France and Belgium.

Owing to the fact that refuse from flax is thrown into the river at certain seasons of the year, the water is rendered absolutely black, and exceedingly offensive. For the purification of this water, the Puech-Chabal system of multiple filtration has been adopted, the plant being at Roncq, about 4 miles from the intake at Bousbecque. As the installation is intended simply for clarification, sand filters have not been included. The apparatus consists of three series of degroisseurs and prefilters, and has a total capacity of 40,000 cubic metres (8,800,000 gallons) per day of twenty-four hours. Before entering the first series of degroisseurs, the water passes through a coagulating basin with a capacity of 1,000 cubic metres (220,000 gallons). The coagulant is furnished by a pump drawing from a mixing tank, but in practice it is only found necessary to employ chemicals on rare occasions.

The first and second series of degroisseurs are divided into four compartments each, and the third series into eight compartments. The total effective area of the sixteen basins is 1,520 square metres (16,355 sq. ft.). All of them are fitted with apparatus for cleaning the gravel by air, as adopted at the Bamford works of the Derwent Valley Water Board. Each basin is divided into four sections for cleaning purposes, and air is applied to two sections at a time, one man managing the apparatus without difficulty.

The mud removed by the degroisseurs is absolutely black, samples of the water taken from each series clearly showing the progressive improvement in the character of the water. The guarantees given by the contractor provide that the water shall be rendered sufficiently clear to enable a printed newspaper to be read through a column of water two metres long; but, in addition to the two-metre tubes, five-metre tubes are also provided, through which it is possible to read the large print in the heading of an ordinary newspaper, whereas with the raw water it is impossible to see any light through a column only one metre long.

The prefilters are eight in number, with a total area of 3,700 square meters (39,812 sq. ft.), each filter being subdivided into four sections, so that cleaning shall not require more than one-thirty-second of the installation to be thrown out of action at a time. Cleaning is effected by a suction dredger on the Boistel system. Only one man is employed to look after the prefilters, including the working of the Boistel apparatus.

As the water is required for industrial purposes only, no bacteriological or chemical tests are made, but simply the physical test for transparency. The apparatus has been working for about eighteen months with entirely satisfactory results.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.Inst C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. Dudley Robinson, B.Sc.(Lond.), *Secretary.*

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

HEAD INSPECTOR OF ROADS. August 22nd. Glamorgan County Council. £200—£250 per annum. —Mr. Geo. A. Phillips, county surveyor, County Hall, Cardiff.

SURVEYOR AND INSPECTOR.—August 22nd.—Fowey Town Council. £120—£150 per annum.—Mr. W. J. Graham, deputy town clerk.

ARCHITECT'S CLERK.—August 22nd.—Felling-on-Tyne Urban District Council (Education Committee). —Mr. R. Hall, clerk.

SURVEYOR AND INSPECTOR.—August 24th.—Mere (Wilts) Rural District Council. £150 per annum. —Mr. R. H. Hiscott, clerk, Council House, Mere.

SANITARY INSPECTOR. — August 24th. — Kent County Council. £120 per annum.—Dr. A. Greenwood, county medical officer, Sessions House, Maidstone.

PIPE LAYER, FITTER, AND WATERWORKS INSPECTOR. — August 25th. — Bishop's Stortford Urban District Council. 30s. per week.—Mr. Robert S. Scott, engineer and surveyor.

ASSISTANT ROAD SUPERINTENDENT.—August 25th.—Willesden Urban District Council. 3½ guineas per week.—Mr. O. Claude Robson, engineer, Municipal Offices, Dyne-road, Kilburn, N.W.

INSPECTOR OF NUISANCES.—August 25th.—Milnrow Urban District Council. £90 — £100 per annum.—Mr. R. R. Jones, clerk.

SANITARY INSPECTOR.—August 25th.—Lewis district of the county of Ross and Cromarty. £160 per annum. with expenses.—Mr. H. Miller, district clerk, Stornoway.

DRAUGHTSMAN.—August 26th.—For South Australian Government railways. £250 per annum.—Mr. J. B. Whiting, acting agent-general, 85 Gracechurch-street, London, E.C.

TEMPORARY SURVEYOR'S ASSISTANT.—August 27th.—Isle of Thanet Rural District Council. £2 2s. per week.—Mr. Chas. Taylor, clerk, Board Room, Minster, near Margate.

GENERAL FOREMAN.—August 27th.—Corporation of Wokingham. 37s. 6d. per week.—Mr. C. W. Marks, borough engineer and surveyor.

CLERK OF WORKS.—August 27th.—Fleet (Hants) Urban District Council. £4 4s. per week.—Mr. W. H. Wright, clerk.

CLERK OF WORKS. August 29th.—Corporation of Walsall. £4 per week. Mr. H. Lee, town clerk.

SURVEYOR'S ASSISTANT. August 29th.—Uxbridge Rural District Council. £2 per week. Mr. C. Wooldridge, clerk, 38 High-street, Uxbridge.

CLERK OF WORKS.—Langport Rural District Council. £2 2s. to £3 3s. per week, according to experience and suitability. Mr. J. Matheson, Langport.

HIGHWAY SURVEYOR.—Boston Rural District Council. £140 per annum.—Mr. H. Snaith, clerk, 10 New-street, Boston.

FOREMAN OF WORKS.—For Nigeria. £250—£300, and allowances. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

TEMPORARY CLERK.—Somerset County Council. £80 per annum.—County Surveyor, Wells.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LIVERPOOL.—September 1st.—Laying out an estate, for the Parks and Gardens Committee. Premiums, 100 guineas, 50 guineas, and 25 guineas.—Town Clerk.

BATLEY.—September 1st.—Designs for a proposed school at Healey, for the Education Committee. From architects resident or practising in Batley.—The Clerk.

GATESHEAD.—September 10th.—Designs for a school for 700 scholars, for the Education Committee.—The Clerk.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

TOTTENHAM.—Designs for a school for 900 scholars, for the Education Committee.—The Clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

EASTRY.—August 24th.—For the erection of six cottages, for the rural district council.—Messrs. Jennings & Gray, 4 St. Margaret's-street, Canterbury.

RATHDRUM.—August 24th.—For the erection of forty-six cottages, for the rural district council.—Mr. P. W. Sheehan, clerk.

MANCHESTER.—August 24th.—For the erection of manager's house at sewage works, for the corporation.—City Architect, Town Hall.

TREDEGAR.—August 24th.—For the erection of a fire station at Harcourt-terrace, Tredegar, for the urban district council.—Mr. W. Edgar Jones, architect, 1 Commercial-street, Tredegar.

ST. AUSTELL.—August 25th.—For the erection of thirty-two workmen's dwellings, for the rural district council.—Mr. W. H. Moffat, surveyor.

LANCASHIRE.—August 25th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, architect, 16 Ribblesdale-place, Preston.

BIRMINGHAM.—August 25th—September 15th.—For the erection of a school, for the Education Committee.—Mr. J. A. Palmer, secretary, Education Office, Margaret-street.

GLAMORGAN.—August 26th.—For alterations and additions to schools, for the county council.—County Hall, Cardiff.

ABERTILLERY.—August 26th.—For alterations and extensions to a school, for the Education Committee.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

HUDDERSFIELD.—August 27th.—For the conversion of police stations into dwellings, for the corporation.—Mr. K. T. Campbell, borough engineer and surveyor, 1 Peel-street.

BRIGHTON.—August 27th.—For the erection of a clock tower in Queen's Park, for the corporation.—Borough Surveyor.

GWYRFAI.—August 28th.—For the erection of thirty-six workmen's dwellings, for the rural district council.—Mr. J. W. Thomas, surveyor, 22 Castle-square, Carnarvon.

ESSEX.—August 31st.—For the erection of a handicraft centre, for the Education Committee.—Mr. G. Topham Forrest, county architect, 73 Duke-street, Chelmsford.

ESSEX.—August 31st.—For the erection of a new bridge over the river Blackwater, in the parish of Langford, in ferro-concrete (on the Hennebique system), for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

LEICESTER.—September 1st.—For the erection of classrooms and additions, for the corporation.—Borough Engineer.

CANNOCK.—September 1st.—For the erection of a school, for the urban district council.—Messrs. Bailey & Solon, architects, Bridge-street, Walsall.

KEIGHLEY.—September 2nd.—For the erection of boundary walls, shelter, and railings, for the corporation.—Borough Engineer.

NORTH RIDING.—September 4th.—For the erection of a school, for the Education Committee.—Mr. J. C. Wrigley, secretary, Education Offices, Northallerton.

SHEERNESS.—September 7th.—For the demolition of engine-house and the construction of a new building and other works, for the urban district council.—Mr. F. W. S. Stanton, engineer, 3 Victoria-street, Westminster, S.W.

ILFORD.—September 8th.—For the erection of workshops at the electricity works, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

ILFORD.—September 8th.—For the erection of refuse destructor buildings, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

FARNWORTH.—September 12th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

BRADFORD.—September 16th.—For the erection of eight workmen's dwellings, for the corporation.—Mr. F. Stevens, town clerk.

Iron and Steel.

MANCHESTER.—August 25th.—For the supply of cast-iron pipes for heating purposes, for the Tramways Committee.—Mr. J. M. McElroy, general manager, Corporation Tramways, 55 Piccadilly, Manchester.

KEIGHLEY.—September 5th.—For the supply of cylinders for reservoir works, for the corporation.—Mr. M. R. Barrett, engineer, Town Hall.

Roads.

ALDERLEY EDGE.—August 22nd.—For the supply of 400 tons of tar-macadam, for the urban district council.—Mr. Walter Cobbett, clerk.

WIGAN.—August 24th.—For the supply of granite cubes and setts and tramway rails, for the corporation.—Mr. A. T. Gooseman, borough engineer.

HALIFAX.—August 24th.—For grouting with pitch or other approved material 30,000 super. yds. of granite macadam, for the corporation.—Mr. J. Lord, borough engineer.

EPSOM.—August 24th.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor, Waterloo-road, Epsom.

BARNET.—August 24th.—For providing and laying tar-macadam, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor.

RUNCORN.—August 25th.—For the supply of 1,000 tons of broken stone and road metalling, for the urban district council.—Mr. James Wilding, surveyor.

WEST HARTLEPOOL.—August 25th.—For making up certain streets, for the corporation.—Mr. Nelson F. Dennis, borough engineer and surveyor.

SWANSEA.—August 25th.—For the execution of private street works, for the corporation.—Mr. George Bell, borough surveyor.

CASTLEFORD.—August 26th.—For works of street [illegible] Mr. W. [illegible]

WILLESDEN.—August [illegible] Mr. [illegible] road, Kilburn.

WALLASEY.—August [illegible] Mr. [illegible] Wallasey.

ABERCYDY.—August 29th.—For [illegible] Mr. W. F. Macindor, town clerk.

SHEFFIELD.—August 29th.—For [illegible] —Mr. A. Wilson, surveyor, West-street.

HIRSTALL.—August 31st.—For [illegible] stone, surveyor.

CARMARTHEN.—August 31st.—For [illegible] Mr. G. Henry, county surveyor, Shire Hall, Llandilo.

DOVER.—August 31st.—September 1st.—For [illegible] quantities and Gaseous quantities [illegible] and Gaseous fittings. [illegible] Mr. R. E. Knocker, town clerk.

SOUTH MIMMS.—September 1st.—For the supply of Leicestershire or other granite, chippings, double-screened hoggin, single-screened hoggin, and 6,000 gallons of distilled tar, for the rural district council.—Mr. G. Sincox, surveyor, "Bearwood," Great North-road, Potter's Bar.

WALLASEY.—September 1st.—For the supply of a 12-ton compound steam roller, for the corporation.—Borough Engineer and Surveyor, 18 Falkland-road, [illegible] Wallasey.

EASINGTON.—September 1st.—For making up and paving certain private streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

FRIERN BARNET.—September 3rd.—For kerbing [illegible] and the eastern portion of Athenæum-road, Whetstone, N., for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor, Council Offices, The Priory, Friern Barnet, N.

RUISLIP-NORTHWOOD.—September 5th.—For making up a private street.—The Surveyor, Northwood.

STAINES.—September 5th.—For road works in connection with the construction of the Metropolitan Water Board reservoirs, for the rural district council.—Mr. G. W. Manning, surveyor, London-road, Ashford, Middlesex.

LLANDUDNO.—September 7th.—For work of road construction, for the Joint Committee.—Mr. W. T. Ward, engineer, Town Hall, Llandudno.

SUNBURY.—September 7th.—For the reconstruction of two roads, for the urban district council.—Mr. H. F. Coales, engineer, Council Offices, Sunbury-on-Thames.

SOUTHAMPTON.—September 7th.—For the execution of private street works, for the corporation.—Borough Engineer.

ITCHEN.—September 7th.—For executing works in certain roads, for the urban district council.—Mr. T. A. Collingwood, surveyor.

BRIGHTON.—September 8th.—For the supply of dressed kerb and channel, for the corporation.—Borough Surveyor.

CLUTTON.—September 8th.—For steam rolling and scarifying, for the rural district council.—Mr. J. S. Drury, clerk, Temple Cloud, Bristol.

TODMORDEN.—For paving several streets, for the corporation.—Borough Surveyor.

Sanitary.

TENDRING.—August 24th.—For works of scavenging, for the rural district council.—Mr. A. J. H. Ward, clerk, 42 Church-street, Harwich.

KIRKBY-IN-ASHFIELD.—August 24th.—For work of sewerage, for the urban district council.—Mr. W. Dodsley, surveyor, Urban-road, Kirkby-in-Ashfield.

ROTHERHAM.—August 24th.—For laying stoneware pipe sewer, for the rural district council.—Mr. B. Hey, engineer, Imperial Buildings, Rotherham.

CHORLEY.—August 24th.—For the construction of a sewer and manholes, for the rural district council.—Mr. A. Jolly, surveyor.

ALARGAM.—August 29th.—For [illegible] pipes, for the urban district council.—Mr. D. E. Jones, clerk, [illegible]

CONTLEBART.—August 28th.—For [illegible] Mr. [illegible]

SWANSEA.—August 29th.—For [illegible] surface-water drainage, for the rural district council. Mr. G. Powell Thomas, surveyor, Station-road, Floresstach.

TOTTINGTON.—September 1st.—For the provision and laying of about 8,060 lin. yds. of cast-iron and stoneware pipe sewers, manholes, and storm-water chambers; also alterations to screening chamber, and tanks, and the construction of sedimentation tanks, percolating filters, humus tanks, sludge beds, channels, and diversion of stream course, for the urban district council.—Mr. L. Kenyon, engineer, Council Offices.

HEXHAM.—September 5th.—For the execution of [illegible] the rural district council.—Messrs. D. Balfour & Son, 3 St. Nicholas-buildings, Newcastle-on-Tyne.

ST. ALBANS.—September 5th.—For works of sewerage, consisting of pipe sewers, manholes, flushing apparatus, gullies, and connections, for the corporation.—Mr. H. Humphreys, engineer, 28 Victoria-street, Westminster, London, S.W.

ITCHEN.—September 7th.—For [illegible] water drainage, for the urban district council.—Mr. T. A. Collingwood, surveyor, Woolston.

RHYMNEY VALLEY.—September 9th.—For the construction of main outfall sewer, about 10 miles long, for the Sewerage Board.—Messrs. Wilcox & Raikes, 9 Victoria-street, Westminster, and Mr. T. J. Thomas, 36 High-street, Bargoed, Glam.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

BRADFORD.—August 31st.—For the supply of [illegible] meters, pipes, castings, wrought-iron steam tubing, iron, steel, charging shovels, oxide wiskets, weed brooms, cotton waste, engine oil, cylinder oil, brass main gas cocks, lime, copper lamps, iron lamps, and sheet glass and opal glass for street lamps, for the corporation.—Mr. F. Stevens, town clerk.

ROCHESTER.—September 1st.—For the supply of tools, horse hire, forage, Portland cement, brooms, oils, paving materials, road metal, and coal, for the corporation.—Mr. William Banks, city surveyor.

Miscellaneous.

CHEPPING WYCOMBE.—August 24th.—For a two-cell refuse destructor, with water-tube boilers, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor and engineer, High Wycombe.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BROMLEY.—For the supply of 3,500 cub. yds. of broken stone, for the corporation. Mr. S. Hawkins, borough engineer:—

	Per cub. yd. s. d.
British Macadams, Limited, London (Penmaenmawr)	18 3
Brooke's, Limited, London (Guernsey)	18 0
W. Griffiths & Co., London	17 9
J. Mowlem & Co., London	17 6
A. & F. Manuelle, London	17 7
Fry Brothers, Greenwich	17 3
F. Hodson & Son, Nottingham (Leicester)	16 6

BROMLEY (Kent).—For the erection of a shelter at Whitehall recreation ground, for the corporation. Mr. S. Hawkins, borough engineer:—

Hill & Gurr, Bromley, Kent	£147
W. S. Graty, Bromley, Kent	128
Treasure Brothers, Orpington*	118

BLYTH.—For the erection of stores and workshops, for the urban district council.—Mr. R. Grieves, surveyor:—

Cook Brothers, Blyth	£1,219
Robson & Waddle, Blyth	1,100
Hedley & Sons, Blyth	1,081
R. Baxter, Blyth*	1,045

GOSFORTH.—For the construction of a flagged footway, for the urban district council.—Mr. G. Nelson, surveyor.

G. E. Simpson, Newcastle-on-Tyne	£432
J. W. Henderson, Gosforth	364
W. Tulip, Gosforth	341

LITTLEHAMPTON.—Acceptes for the erection of a public lavatory, for the urban district council.—Mr. H. Howard, surveyor:—

G. E. Hayward, Littlehampton, £54.

POCHDALE.—For making up certain streets, for the corporation.—Mr. S. S. Platt, borough surveyor.

R. Lomax, Eccles.

TAUCASTER.—For the construction of about 160 yds. of 6-in. sewer, with manholes, for the rural district council.—Mr. H. M. Driver, surveyor:—

A. Wilson, Woodlesford, £80.

WEST SUSSEX.—For the erection of a school at Horsham, for the Joint Education Committee.—Mr. Hadyn P. Roberts, education architect, Worthing.

Cropley Brothers, Limited, Epsom	£6,944
B. Lindfield & Sons, Horsham	6,890
J. Backes & Sons, Brighton	6,408
Crosby & Co., Limited, Farnham	6,275
Reeves & Port, Rudgwick	6,260
J. Longley & Co., Crawley	6,248
A. Crane, Worthing	6,231
A. Peskett & Co., Crawley	6,195
Murrell Brothers, Horsham	6,104
Rowland Brothers, Horsham	6,099
W. Willett, Shoreham-by-Sea	6,079
R. Cook & Sons, Crawley	5,995
F. Sandell & Sons, Worthing	5,900
W. F. Sendall & Co., Horsham	5,677
H. Baker & Son, Horsham	5,625
G. Potter, Horsham (revised tender)	5,408

WEST SUSSEX.—For alterations and additions to a school, for the county council.—Mr. H. P. Roberts, architect, Worthing:—

F. Sandell & Sons, Worthing	£570
J. Beall, Tillington	508
H. C. Deane & Son, Midhurst	150
H. Tribe & Sons, Midhurst	446
G. Luff, Midhurst	435

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WILLESDEN DISTRICT COUNCIL.
APPOINTMENT OF ASSISTANT ROAD SUPERINTENDENT.

The Willesden District Council invite applications for the position of Assistant Road Superintendent.

Applicants must not be less than thirty, and not more than forty-five years of age, and with some experience as to the maintenance of highways.

Applications, in candidate's own handwriting, stating nature of present employment, with copies of not more than three recent testimonials, to be delivered to the undersigned not later than 4 p.m. on Tuesday, August 25, 1914.

The salary will commence at 3½ guineas per week. A conveyance for travelling will be provided by the Council.

The person appointed will be required to devote his entire time to the duties of his office, and the appointment will be determinable by a month's notice upon either side.

(By order)

O. CLAUDE ROBSON,
Engineer to the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
August 5, 1914. (1,844)

TEMPORARY CLERK in County Surveyor's Office, Wells. Must be expert shorthand writer and typist. Salary £80 per annum. Apply, in writing only, stating age, qualifications and references, County Surveyor, Wells, Somerset. (1,860)

SWIMMING BATHS WATER PURIFICATION.

IMPORTANT TO MUNICIPAL AUTHORITIES:

Is the water in the Swimming Ponds under your control **always** clear, free from any dullness, and equally bright and attractive **at all times?**

Are the bathers satisfied they can obtain equally good conditions of bathing **every day?**

Is the water free from all **brown stain?** Can you distinctly see a hairpin lying on the bottom of the pond at the deep end?

Unless these questions can **all** be answered in the affirmative, why not adopt our System of Purification, whereby we will guarantee to fulfil all the above conditions with complete success? At the same time the cost of water saved annually will in a few years pay for the plant.

By our System of **Treatment** and **Sterilization** of the water, not only is its Chemical and Bacterial Purity maintained, but freedom from all **disease-germs** is absolutely ensured.

Send us Architect's plans of the baths, and we will furnish Estimates and Plans of the apparatus free. Please at the same time refer to our guarantee.

WRITE FOR PAMPHLET

THE "TURN-OVER" FILTER CO.,
39 CHICHESTER STREET,
BELFAST.

Or Messrs. J. BLAKEBOROUGH & SONS,
BRIGHOUSE.

BISHOP'S STORTFORD URBAN DISTRICT COUNCIL.

The Bishop's Stortford Urban District Council [illegible] a competent Pipe Layer, fitter and Waterworks Inspector, at a wage of [illegible] per week.

Age not to exceed 40 years.

Applications, which must be on Forms to be obtained from the undersigned, stating age, [illegible] experience and [illegible] to be sent in not later than Friday, the 28th instant, endorsed "Pipe and Inspector," addressed to

ROBERT S. SCOTT,
Engineer and Surveyor.

Council Offices,
Bishop's Stortford.
August 14, 1914. (1,862)

FOREMAN OF WORKS required for Nigeria for a term of 8–12 months, with possible extension. Age 25–40. £270–£10–£300. Single furnished quarters or allowance. Second-class passages; liberal leave. Candidates must have had considerable experience with a Municipal Authority, and be thoroughly conversant with road and building [illegible], laying of drains and sewers, also thoroughly understand levels, be able to read plans and section of buildings, drains, &c., and set out work.—Apply at once to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (1,864)

TENDERS WANTED.

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

RECONSTRUCTION OF LANGFORD BRIDGE, MALDON.

Tenders are invited from Contractors licensed to execute Ferro-concrete work on the Hennebique system for the Erection of a New Bridge over the River Blackwater, in the Parish of Langford, near Maldon.

Drawings may be seen and Specifications obtained, on and after Tuesday, August 18th, 1914, upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Langford Bridge, Maldon," to be delivered to this Office not later than the first post on Monday, August 31st, 1914.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
August 13th, 1914. (1,857)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

RECONSTRUCTION OF FINGRINGHOE BRIDGE, WIVENHOE, NEAR COLCHESTER.

Tenders are invited from Contractors licensed to execute Ferro-concrete work on the Hennebique system for the Erection of a New Bridge over the Roman River, in the Parish of Fingringhoe, Wivenhoe, near Colchester.

Drawings may be seen, and Specifications obtained, on and after Wednesday August 19th, 1914, upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Fingringhoe Bridge, Wivenhoe," to be delivered to this Office not later than the first post on Monday, August 31st, 1914.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
August 13, 1914. (1,856)

There is ONE

NONSLIP STONE

and ONE only.

THE HARD YORK NONSLIP STONE CO.,
(BROOKES LTD.,)
HEAD OFFICES: HALIFAX.

LONDON: CAXTON HOUSE, WESTMINSTER, S.W.

MANCHESTER: 8 EXCHANGE STREET.

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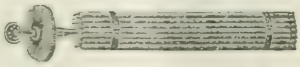

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The Surveyor

And Municipal and County Engineer.

Vol. XLVI AUGUST 28, 1914. No. 1,180.

Minutes of Proceedings.

Salt-glazed Ware Pipes: British Standard Specification.

The desirability of standardising "stoneware" sewer and drain pipes was urged upon the Engineering Standards Committee at different times from various quarters, and more particularly by the Institution of Municipal and County Engineers, who appointed a committee for the purpose of obtaining information from their members with regard to their requirements for a standard specification. The data thus collected was then summarised by that institution in the form of a draft specification and placed at the disposal of the Engineering Standards Committee. A representative and well-attended conference of users and manufacturers was called early in 1911 to consider whether the standardisation of this class of pipe was desirable, and the opinion of the meeting being unanimously in favour of such a proceeding, the Main Committee formed those attending the conference into a Sectional Committee under the chairmanship of Sir Maurice Fitzmaurice, C.M.G. At an early stage of the work it was found desirable to discard the use of the term "stoneware" as being difficult of definition, and to adopt the term "salt-glazed ware," which was sufficiently descriptive of the pipes, the quality being safeguarded by the imposition of an absorption test.

In drawing up their recommendations for salt-glazed ware pipes, the committee were able to avail themselves of the draft standard specification drawn up by the Standardisation Committee of the Institution of Municipal and County Engineers previously referred to, and of a draft specification based on the proposals of that institution which was subsequently submitted by the pipe manufacturers on the Sectional Committee as the result of a long series of conferences among the manufacturers. These drafts were of material assistance in forwarding the work of the committee, and were of very great help in leading up to the formulation of the standard specification which has now been issued.* The question of putting forward a standard form of socket which would produce in unskilled hands better alignment than the form in most general use occupied the attention of the committee for some considerable time; but, in view of the importance to the industry of not materially increasing the cost of salt-glazed ware pipes, it was not found practicable to proceed with the matter, and therefore, as regards the sockets, only the minimum mean thickness and minimum internal depth, and a minimum jointing space have been specified. The specification divides the pipes into two classes—viz., British Standard Pipes which are made with the intention of complying with the specification, but of which only a percentage are required to be submitted to the hydraulic test, and British Standard Tested Pipes—that is to say, pipes which have been individually subjected by the manufacturer to the hydraulic test laid down in the specification. Among the other points dealt with are the absorption test, permissible limits of deviation from thickness, standard diameter, and straightness, and a standard mark for all pipes complying with the British Standard Specification. The specification is one that should be in the hands of all municipal engineers and architects.

* * *

Sewer Explosions.

The explosions which have occurred from time to time—and possibly with greater frequency in recent years—in sewers are apt to be so disastrous in their consequences, either to life or property, as to merit a very thorough investigation into their cause and possible prevention. The provisions of the Public Health Acts which are designed to prevent the passing of injurious matters into sewers are limited to the prohibition of such matters as would in themselves either interfere with the free flow of the sewage or injure the sewer. Further, it is an offence to permit the entry into a sewer of any chemical refuse, waste steam, condensing water, heated water, or other liquid which, either alone or in combination with the sewage, causes a nuisance or is dangerous or injurious to health. These provisions do not touch the problem of the prevention of explosions, which are due in the main to the mixture of either petrol vapour or coal gas with the sewer air. There can be no doubt that comparatively large quantities of petrol find their way directly into sewers from both public and private garages, and this source of danger could be entirely prevented by the exercise of a little thoughtfulness on the part of those responsible, who probably do not in most cases realise the danger to which they

* The price of the report is 5s. 2d., post free, and it may be obtained from any bookseller, or direct from the offices of the committee, 28 Victoria-street, Westminster. It is published for the committee by Messrs. Crosby, Lockwood & Son, 7 Stationers' Hall-court, Ludgate-hill, E.C., and 5 Broadway, Westminster.

[illegible] In New York [illegible] inflammable oils from flowing into the sewers. It [illegible] exclusion of these dangerous matters from the [illegible] and of the general composition of sewer air is therefore of great practical importance.

In a [illegible] the *Engineering Record* there appeared a description of a very ingenious apparatus designed by Prof. Dean, of Yale University, for obtaining samples of the atmosphere inside a sewer. The direct method of entering a [illegible] with a jar filled with water and emptying it [illegible] the sewage was found to be inexact, owing to the changed conditions caused by the opening of the manhole. It was to meet this difficulty that Prof. Dean designed his apparatus. This consists of a long rubber tube let down into a manhole through the small opening left by just starting off the cover. After sounding for depth to find the length of tube needed to reach nearly to the surface of the stream, a bulb on the upper end of the tube is worked until both the rubber tube and the bulb are filled with the sewer atmosphere. Then a small, collapsed, rubber toy balloon is slipped over the firing end of the short piece of brass tubing to which the long rubber suction tube is also attached. Projecting from the brass tube into the balloon are the ends of two insulated wires from a dry cell battery connected by a fine platinum wire. When the balloon is well filled, by further pumping, the stopcock in the brass tube is shut, to prevent back-firing, and the circuit is closed by pressing the button. When the platinum wire becomes heated, if there is an explosive mixture in the sewer the contents of the balloon are exploded. The apparatus is one of great practical utility, and might with advantage be used on any occasion when men are asked to descend into a suspected atmosphere.

* * *

Housing and the War.

Among the Acts passed by Parliament prior to the adjournment on August 10th was the Housing (No. 2) Act, 1914, which provided for the issue of a sum of four millions sterling for housing purposes within a year from that date. The intention of the Government in passing this Act was that the sums made available under it should be utilised for the joint purposes of providing and improving housing accommodation for the working classes, and of preventing or mitigating unemployment in the building trade. It certainly appears to be a wise policy to keep the building trade supplied with useful work, rather than to allow conditions of bad trade to arise with all the consequent waste of money on costly and more or less ineffective relief works. As will be seen from the report of the proceedings which we give in another column, the administration of the new Act formed the subject of a deputation from the National Housing and Town Planning Council which was received by the President of the Local Government Board on Friday last. The deputation fully recognised the desire of the Government to do all in their power to stimulate the building of houses by local authorities and by public utility societies during the war period. In order, however, that the local authorities may be induced to take up the matter with the necessary enthusiasm, it must be made possible for them to borrow the money required at a sufficiently low rate of interest. To meet this point we note with satisfaction that Mr. Herbert Samuel was able to announce, in the course of his reply, that the Treasury will be prepared, so far as circumstances may permit, to consider advances to local authorities of money for approved schemes of building at the same rate as the Government itself is able to borrow. In regard to another point, too, the President's reply was very satisfactory, inasmuch as he made it clear that money lent under the Act would be lent for periods of sixty years for buildings and eighty years for land. A majority of the members of the Committee of the National Council have expressed the view that it is most important that the Government should stimulate local authorities in undertaking housing schemes by making capital grants in aid of the expenditure upon such schemes. This raises a very debatable question of policy which has formed the subject of acute controversy in the past, and it is not surprising therefore that Mr. Herbert Samuel stated that it was not the intention of the Government to use the sum granted under the Act for the purpose of grants in aid. If this were done, every local authority borrowing money would expect to get a grant. The fact that such an Act was passed, together with the tone of the reply of the President of the Local Government Board to this deputation, alike show an earnest desire on the part of the Government to do everything possible to stimulate housing action by local authorities in this period of national need.

* * *

Labourers' Cottages on the Quadruple System.

We give elsewhere an article on rural labourers' cottages which demands very close attention, as it is evident that the designer of these cottages has carefully studied the subject and "knows what he is talking about." The cottages are designed in blocks of four, and although an adverse critic might say that they savour of the back-to-back type, it must be remembered that there are hundreds of existing cottages which have no "through" ventilation, and that this is not required in the open country. The design shows windows of extra large size, and ample ventilation would be secured. The great point is that these cottages, which provide all the necessary accommodation, can be constructed at £150 each, and that this price is essential when considering the question on economic grounds. It is useless to build cottages which either require, in order to make them self-supporting, a rent which the occupier could not pay, or to subsidise them from the rates, as in the latter case it would naturally mean giving to certain individuals an advantage which would be most unfair to their neighbours. A "premiated" cottage would be unsound altogether on the lines of political economy.

We congratulate the author and designer of these cottages, which are also of considerable architectural merit, and quite unlike the monstrosities which are sometimes designed to meet this difficult question. Our correspondent's description and his remarks on the general question of rural housing are excellent. Although this country is at the present moment going through the gravest crisis it has ever encountered, there may come a time when this very important question of rural housing must be taken up in earnest, and we are glad to be able to place these proposals before our readers. We observe in cubing out the contents of the cottages, that at the price given it works out at 4½d. per cubic foot. This price is low, but the work is simple, and the price might suffice in some districts.

* * *

Rural Housing in Ireland.

It is a remarkable fact that while in Great Britain the problem of rural housing remains in what may be not incorrectly described as its initial stages, it has in Ireland been brought to the test, if not of solution, at least of very substantial development. The economic change effected in Ireland by the Labourers' Act amounts almost to a social revolution. Under it there have

been built 43,702 cottages, and the rent received last year was £123,896 which is equivalent to an average weekly amount per cottage of one shilling. This latter figure will make a forcible appeal to our imagination on this side of the Irish Channel, for we have been accustomed to regard the economical aspect of rural housing with something approaching to concern. There is, of course, a disparity of conditions as between the two islands, yet even when this is allowed for the remarkable cheapness with which extensive housing schemes have been carried out in Ireland is none the less a striking feature of the situation. The figures show some peculiar variations in numbers, which are no doubt due to local circumstances chiefly—to the fact that in some localities there is a preponderance of peasant proprietors, for whom the houses are not intended or provided, while in others the labourers pure and simple are in a majority. This, for example, accounts for the fact that in Connaught the number of cottages is 2,165, while no fewer than 15,959 have been built in Leinster, 17,988 in Limerick, and 7,590 in Ulster. In the southern province of Munster £3,231,571 has been invested in cottage building, and in Ulster the capitalised value of the rural cottages provided under the Labourers' Act is £1,747,384. Such totals are a testimony, if any testimony be needed, to the far-reaching effects of the Act; but it is only when we come to details that the real burden imposed upon the local authorities can be appreciated at its true value. Connaught, for instance, has spent upon housing £35 per agricultural labourer, Ulster £42, Leinster £76, and Munster £91. Limerick is credited with the largest number of cottages of any county in Ireland in proportion to its population. The expenditure is equivalent to 1s. 3d. per £ on the valuation. One welcome and beneficent result is to be recorded from the operation of the first Labourers' Act—viz., that after it came into operation in 1883 emigration from Ireland began to decrease, and it has been so appreciably reduced within recent years that the population has ceased to decline. Altogether, it is a very remarkable story, alike economically and socially, that is enshrined in the rural housing legislation of Ireland, and it is to be hoped that in England, Scotland, and Wales we shall be able at no distant date to congratulate ourselves upon equally satisfactory results from the recent activities of the Government.

* * *

Rainfall in 1913.

The importance of the work carried on by the British Rainfall Organisation is so great that we feel more than justified in referring at some length each year to the exceedingly interesting annual volume which is published by that body. The volume for 1913 is now before us, and is the fifty-third of an unbroken series forming a unique and valuable record of the rainfall of the British Islands. The organisation depends very largely for its information upon a large number of voluntary observers, and we venture to suggest that this is a matter in regard to which assistance might very fittingly be given by municipal engineers when required. The value of the data founded upon this systematic work in the field of climatology, particularly for purposes of water supply, is sufficiently obvious, and need not here be insisted upon. The tables and statistics in the volume now under notice are founded principally upon complete daily records received from no fewer than 3,370 stations. Among the special articles included in the book is one on the "Dry Summer of 1913," which well illustrates the difficulty of gathering anything like an accurate impression of weather conditions in the absence of scientific observations. To be told that the summer of 1913 was as remarkable for deficiency of rainfall as that of 1912 was for heavy rains, is itself a little surprising to the average man upon whose mind remains a vivid impression of the devastation in East Anglia, and the ruined harvest of the latter year; but to be further told that the drought of 1911, although standing out prominently in the popular imagination, was really less remarkable than that of last summer is even more surprising. That this is indeed the case, however, is proved by the statistics gathered during the two years in question. It should be mentioned that the volume, as in the case of its predecessors, is illustrated by a number of valuable maps, and has as a frontispiece an excellent photograph of the late Sir John Murray, one of the trustees of the organisation, a feeling appreciation of whose life and work is contributed by Dr. Hugh Robert Mill, who retains the office of director.

* * *

Sewage Disposal and the Protection of Water Supplies.

The problem of protecting water supplies from pollution is always a difficult one on account of the various interests concerned, but it is much more complicated where the waters in question form the boundary between two countries, as in the case of the United States and Canada. It is obvious that it would be useless for one of the two countries alone to carry out any measures of protection, and joint action is essential if any satisfactory results are to be obtained. Fortunately, in the above case this has been done, and the report of a joint conference of engineers, which we print on another page, is of considerable interest and importance. In the first place, it is stated that even river waters which receive the drainage of agricultural and grazing lands are unsafe for use without previous purification. On the other hand, it is admitted that river waters into which the sewage of towns is discharged may safely be used for drinking purposes if the water is purified. Further, the opinion is expressed that the protection of public water supplies is more economically secured by water purification at the intake than by sewage purification at the sewer outlet, but it is admitted that under some conditions both water purification and sewage treatment may be necessary. Disposal by dilution is considered ample for the treatment of sewage in the case of the larger streams and rivers and the lakes, and any elaborate purification by modern processes of filtration are believed to be unnecessary. These opinions are interesting, as they confirm the views of our own Royal Commission to the effect that the disposal of sewage by dilution, under suitable conditions and subject to the removal of the suspended solids, may be adopted without risk of creating a nuisance.

* * *

Proposed Health Week and the War.

We understand that the committee directly concerned with the movement, in conjunction with the Royal Sanitary Institute, are carefully considering the question of the advisability of proceeding with the arrangements for the holding of the National Health Week in November next. On the one hand, whereas it is possible that everyone will be otherwise engaged, on the other hand there is no doubt that questions of sanitation play a very important part when in war. Bitter experience has taught us that the loss of life due to epidemics during a war is far greater than that at any other time, and although it seems almost inconceivable that war will actually reach this island, it is of the utmost importance that we should be prepared for the worst. Should the committee decide to abandon the holding of Health Week, could not the organisation which has already been put in force do something to educate the people on the lines of taking all necessary individual precautions to prevent any spread of an epidemic?

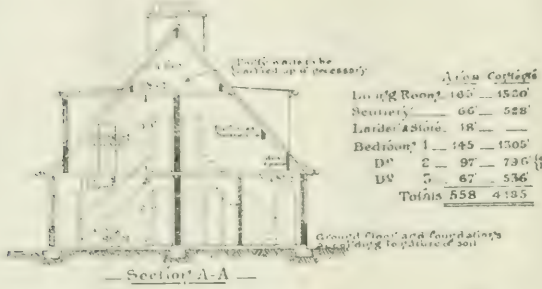
Rural Labourers' Cottages.

A QUADRUPLE SYSTEM: £150 STANDARD TYPE.

(By a Correspondent.)

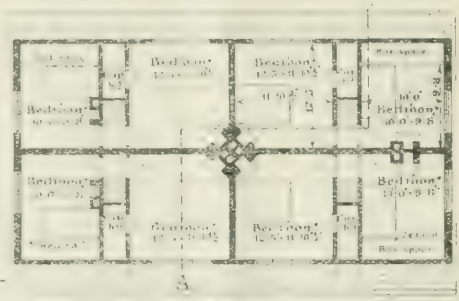
[illegible] Government [illegible] August 21, 1914 [illegible] Housing [illegible] Rural Labourers' Cottages [illegible] the problem [illegible] cottages [illegible] difficulty [illegible] rent [illegible] the other hand, [illegible] a negligible drop.

This quandary is illustrated by the following figures, showing the rents necessary to recoup an expenditure of £150, or at 3 per cent the rate at

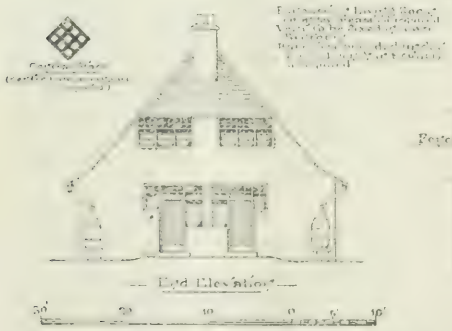


— Section A-A —

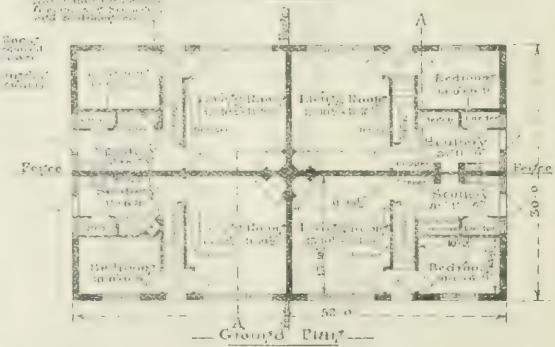
— Front Elevation —



— First Floor Plan —



— End Elevation —



— Ground Plan —

LABOURERS' COTTAGES ON QUADRUPLE SYSTEM.

(Cubic contents, 7,300 ft. at 5d. = £152. Alternative elevations are shown on subsequent pages.)

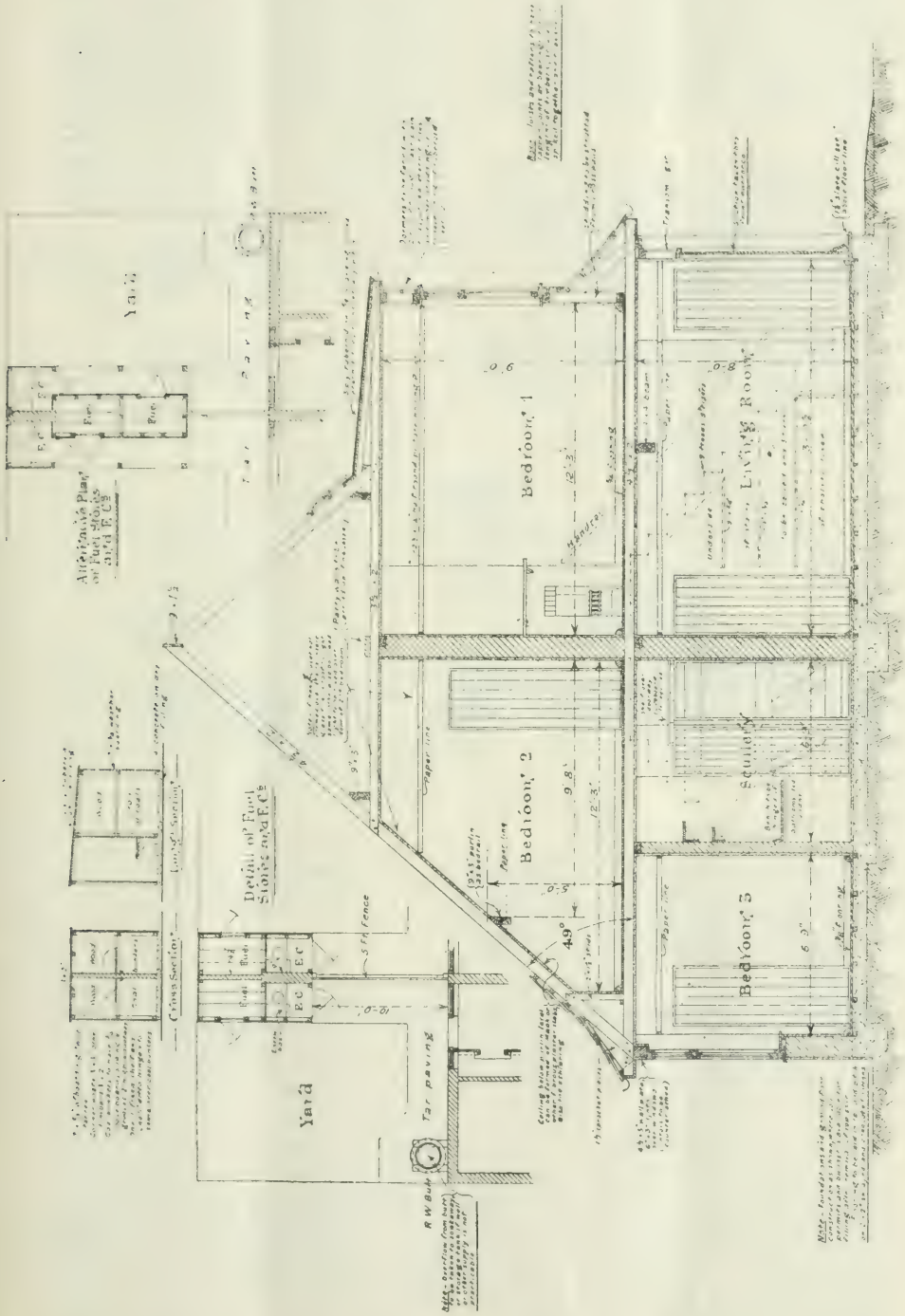
is produced at an expenditure per cottage which shall be low enough to enable their occupants to pay a rent producing a commercial return. The magnitude of the scheme is obvious when we recall that it comprises a total programme of 120,000 cottages; at an average of £150 each this represents £18,000,000.

It has to be remembered that the average labourer, even with a moderate increase of wages in the near future, will be unable to pay more than 2s. 6d. per week rent (exclusive of rates) at the outside. This means either that the total cost of each cottage must be kept down considerably below £150, or that the standard of floor areas and cubic contents of rooms which the Government have so far laid down as a which the Government can borrow), and (*b*) at 4 per cent a sufficiently low commercial return:

	3% basis. £ s. d.	4% basis. £ s. d.
Ground rent on [illegible] acre at £30 per acre	4 6	6 0
Interest on cost of building, £150	4 10 0	6 0 0
Sinking fund on cost of building, 60 years	18 4	12 6
Insurance	2 0	2 0
Repairs, 1½ on cost of building	1 17 6	1 17 6
	£7 12 4	£8 18 0
Per week, inclusive of rates	2 11	3 5

But the problem has not been reduced to even these relatively simple proportions. All the experiments in cheap housing in recent years and especially the exhaustive efforts made quite lately to discover cheap lines of design, show conclusively that the Government standard of accommodation cannot, under average conditions, be pursued at a lower figure than from £170 to £180. If such an expenditure is incurred a result commercially unsound must be reached unless, as already remarked, the Government abandon their carefully considered minimum standard of floor areas and cubic contents of rooms.

One cannot overlook the disturbing fact that



Labourers' Cottages on Quadruple System Enlarged Transverse Section

[illegible] cottages have been produced [illegible] scrutiny, that a drastic evasion of dimensions has very frequently been perpetrated.

[illegible] cottages, on altogether robust and attractive lines, which, while an ornament to our glorious country-side, [illegible] Given entirely new lines of design, this is confidently [illegible] and sections here reproduced illustrate how it is to be done.

[illegible] size, larger or smaller, can be furnished to each cottage in the most effective manner; securing the maximum of light and air, and avoiding any necessary [illegible] ment, which is, of course, inevitable if economy of construction is attempted by building cottages in rows of three or more.

Turning to the ground and upper floor plans, the dimensions of all the rooms, both in floor areas and cubic contents, comply strictly with the minimum standard laid down by the Government. As regards internal planning, it will be seen with what measure of success all those features have been secured, features small individually, but which in the aggregate go so far towards the amenity of a dwelling. Some of them may be enumerated:—

(*a*) The entrance lobby gives access by a straight stairway direct to the upper rooms, a valuable point in many ways—such as sickness, passage of furniture, &c.

(*b*) The living-room, while directly accessible from front door, stairs and scullery, gives the maximum of floor space free of traffic, and an unusually comfortable fireside away from draughts.

(*c*) All chimneys are on inside walls, affording maximum warmth and dryness.

(*d*) All bed spaces are against inner walls, while their positions afford the fullest amount of unimpeded floor space.

(*e*) A bath space is available, if required, under a hinged bench in scullery.

(*f*) Although the upper rooms are above the roof-tie level, it will be interesting to note that three sides of each of these rooms have solid brick walls—a valuable protection against damp and against extreme heat in summer or cold in winter. In the simplest form of construction illustrated it will also be observed that only one side of one room in each cottage has any part of its ceiling sloping.

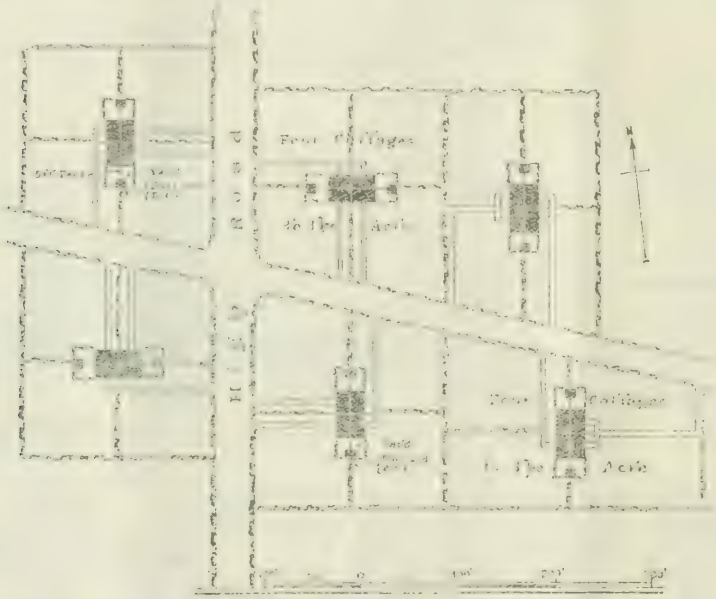
(*g*) The upper internal walls are natural continuations of those below, there being no partition work. Incidentally, it may be remarked that no bedroom adjoins another without a 9-in. wall intervening.

Many other considerations have been kept in view in the details; for instance, it will be seen that, while the space in the second bedroom below the 5-ft. ceiling line is not recognised by the Government requirements as part of the floor area or cubic contents, this space has been left open as a useful receptacle for boxes, boots, &c., while the purlin shown serves as a bedrail to protect the plaster and to mark the paper line.

Turning to general construction, it will be quite obvious that the operation of putting up four cottages simultaneously, the simple run of walls, the straightforward character of floor, roof timbering and roof covering, the proportionately short lengths of eaves, verges and ridges to each cottage, and particularly the small amount of external walling, all conduce in a special degree to economy in the building process, to great reduction of labour in cutting of materials and savings in waste of the latter.

The first floor joists and rafters throughout can be cut out of 4½-in. by 2-in., as the former have in no case a bearing of more than 6 ft. 9 in., and practically any odd lengths can be used up. It is assumed that the recommendations of the Small Holdings Committee, by which timbers can be taken through party walls, will be recognised by the Government; failing this, such timbers can be cut short of the party walls and secured together by dog-irons, the latter being left buried in the brickwork. By-law questions such as this do not, of course, arise in the many rural districts which have no by-laws, nor in those where the Local Government Board Rural Model By-laws have been adopted.

A very important consideration is that this type of cottage can be reproduced in the materials common to practically every district in the kingdom, while the scope of the roof is suitable for any type of tiles, eternit, or other patent covering, although



Labourers' Cottages on Quadruple System. A Colony of Twenty-four Cottages at the Cross-roads.

[illegible] can, of course, be used if local circumstances render it unavoidable.

The ample eaves give specially good protection to the external walls, while the guttering is simple and distributes the rain water easily into a butt to each cottage.

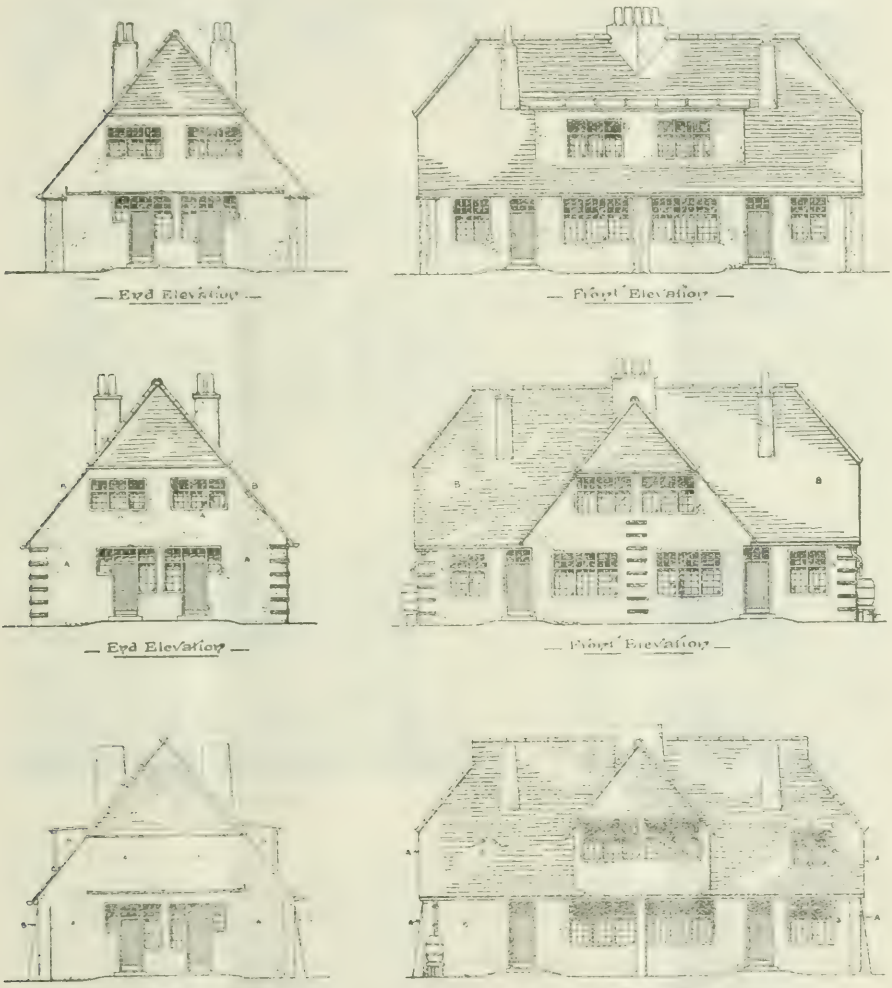
It will be clear that these cottages are not, properly speaking, on the "back-to-back" principle, so much in vogue in some Northern towns, and so rightly condemned. "Back-to-back" dwellings, built in terraces (generally in congested areas), in which the marked feature is the possession of only one outer wall, rendering it impossible to secure effective air currents in the interior, have nothing in common with the type of dwellings now under review and intended for erection on the breezy countryside. Should, however, some academic point be raised in this direction, it may be remarked that the Town Planning Act of 1909 expressly permits the erection of "back-to-back" houses, as that term is commonly understood, provided that the medical officer of health of the district is satisfied that they are efficiently ventilated.

In the designs now being considered all the rooms have their windows, doors and fire openings so arranged that an active circulation of air is secured, and, in addition, a spare flue is provided in the central chimney-stack as an exhaust to which all the living rooms and bedrooms over it can be connected by a vent at the ceiling line.

To revert to the all-important architectural question, it seems quite beyond argument that by no other method of planning can large and robust lines of exterior treatment be wedded to the humble scale of accommodation and expenditure to which we must strictly adhere if the undertaking is to pass the strict actuarial tests of H.M. Treasury.

Incidentally, these large exterior lines of walling and roof lend themselves with peculiar facility to the avoidance of any monotonous effect. A few examples are given of the practically endless variations of treatment obtainable. It has to be borne in mind that any slight additional cost incurred in varying the external treatment of a block is divisible by four in considering the cost of each cottage. It is necessary to add that the plan given is common to all the variations in elevation.

The architectural possibilities cannot fail to be of interest to those who realise the importance of this aspect of the matter, regarded alike from the point of view of public opinion and of the educative results to the occupants, who are bound to experience



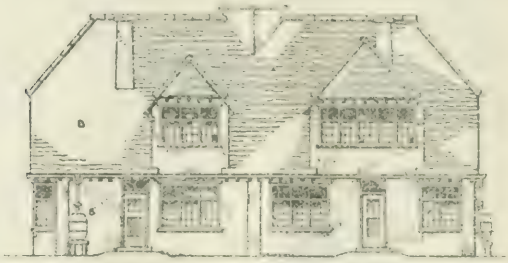
[illegible] Cottages on Quadruple System. Alternative Elevations.

[illegible] pride.

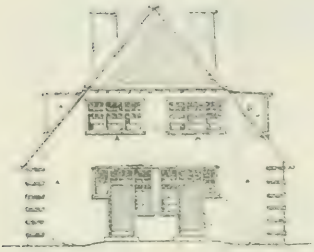
[illegible]

[illegible]

— End Elevation —



— Front Elevation —



— End Elevation —

— Front Elevation —

— End Elevation —

— Front Elevation —

— [illegible] —

— Front Elevation —

LABOURERS' COTTAGES ON QUADRUPLE SYSTEM. ALTERNATIVE ELEVATIONS.

[illegible] 1.62, taken at 5d. per [illegible] [illegible] compares favourably with a large number of designs put forward of late where rates of 4d., 4½d. and even less have been adopted for the [illegible] or increased [illegible] cutting down the standard of accommodation. The answer to this is that wherever cottage work of this class can be carried out at 5d. per [illegible], then the very large savings

in the cottages [illegible] which can be [illegible] to this type of [illegible] [illegible] per cent on the total cost, thus bringing the original figure of £52 down to something under £120, or [illegible] [illegible] work [illegible]

	£	s.	d.
Ground rent, [illegible] at £5 per acre ..		4	6
Interest on cost of building, £120	3	18	0
Sinking fund to cost of building, 60 years ...		15	10
Insurance ..		2	0
Repairs [illegible] on cost of building	1	12	6
	£6	12	10
Per week, exclusive of rates ...		2	6

By [illegible] the Government rate of borrowing at 3 per cent, a rate of 4 per cent is taken, the necessary weekly rent will be 2s. 11d.

These figures can, however, be further appreciably reduced on one condition—viz., that a system of standardisation of materials, joinery, fittings, &c., and purchase of these on a large scale—be inaugurated by the Government. The widely varied external possibilities will not be affected by such standardisation.

The plans and designs are, of course, subject to the Copyright Act, 1911, but copies of the drawings and any further particulars, together with licence to erect at a nominal royalty, can be obtained from the architect, Mr. C. Lavington Fielder, Kingsmead, Latchmere-road, Kingston-on-Thames.

PRO PATRIA.

In THE SURVEYOR of August 21st, in the column of "Things One Would Like to Know," it was asked if it would not be possible to compile an "Honours" list of municipal, engineering and sanitary officials who are taking an active part in the great war. With a view to carrying out the suggestion we publish below such information as has come to hand, and should be obliged if readers would assist us by notifying us of other cases within their knowledge:—

Ashurst, J., city surveyor, St. Albans.

Ayre, C. A., third assistant engineer to the Watford Urban District Council, has received notice to hold himself in readiness for the Special Reserve.

Barker, E. A., electrical engineer, Barnsley Corporation.

Bell, Leonard, sanitary inspector, Westhampnett Rural District Council, Lieutenant and Transport Officer attached to the Eastern Mounted Brigade of Field Ambulance (Territorials).

Blake, Leslie, assistant surveyor to the Wincanton Rural District Council.

Jenner, ——, inspector of nuisances to the Battle Rural District Council.

Middleton, ——, inspector of nuisances to the Charlton Kings Urban District Council.

Aberdeenshire Roads.—The road surveyor to the Deeside District Committee, Mr. A. H. Clayton, reported recently that for the past year the total quantity of material applied over the 310 miles of roads maintainable by the committee, for road maintenance alone, amounted to 30,168 tons, and to that quantity had to be added 10,000 tons of strengthening and surfacing material which was applied, under contract, to the section of the Braemar-road between Ballater and Coilacreich. The application of that large quantity of material was, he was happy to say, having the desired effect. In his opinion, this wholesale strengthening of weak roads with local materials not only solved the problem of movement in the subcrust, but also provided a reliable foundation upon which might be applied the improved surfacing materials now in vogue. During this summer a length of roadway running through the village of Braemar was repaired with a strong coating of broken stones bound together with pitch-grouting, and surfaced with a small-gauge material similarly treated. The cost of this system worked out at 2s. 6d. per square yard, compared with 1s. per square yard for the ordinary water-sweep system, and although there is a big difference in the initial cost of laying the systems, the pitch-grouted roadway, with a much longer life, would ultimately work out as cheap as the old system, with the additional benefits of a smooth, waterproof, and less dusty surface.

SANITATION OF A HEALTH AND PLEASURE RESORT.*

By THOMAS SANDERSON,

Chief Sanitary Inspector, Blackpool.

Blackpool is classed and always spoken of as a town of 66,000 inhabitants, but we have housing accommodation in the town for between 400,000 and 500,000 people; and this, I think, constitutes a fairly large town or city; consequently it is necessary for us to have a staff of sanitary officials capable of dealing with the work of a town with a population of 400,000, in addition to the day visitors, during the visiting season.

In the year 1903 we set a certain standard of sanitation for all houses in the borough, and a house-to-house inspection and testing of drains was commenced in a systematic manner.

On receipt of the inspector's reports the drains are tested and examined—that is, yard drains, cellar drains, and front rain-water drains.

The district inspectors then survey the house and draw a plan to ½-in. scale, showing the ground floor, cellar, yard, front garden, drain and sewer. The usual notices are served, and when the work is completed a full report of the work carried out is entered and the new system of drainage placed on the plan.

The work done in practically all cases is that the drains are relaid in an up-to-date manner, intercepted by a suitable intercepting trap, inlet and outlet ventilators, yard service re-formed with concrete, flags or asphalt, the front garden surface formed in such a manner as to prevent dampness to the house, damp-proof courses fixed in walls where there is any sign of dampness, sites drained where required, cellar surfaces formed with concrete or flags, cellar areas formed for the placing of gullies for cellar drainage. No drains are allowed under the house, except where it is impossible for them to be placed elsewhere, and in such instances the earthenware pipe drain is embedded in good concrete 6 in. thick, or iron pipes substituted.

Any water-closet inside the house that is not self-cleansing is abolished, all boxed-in seats are abolished where new water-closets are fixed, all defective or tapped T pieces in soilpipes are abolished, and joints repaired. Roofs, roof gutters, downpipes, &c., are put in proper order, and each bedroom in which there is no fireplace is ventilated. We have only about six months in every twelve that we can carry on this work in large property, as it is impossible to do such work when there are visitors in the houses.

All new property previous to occupation is inspected, and the drains, soil pipes, water-closets, &c., tested by the health department and reported upon to the borough engineer, who sees that any defects reported to him are made good.

The sewage here is discharged into the sea by two separate outlets, the sewage being screened. The foreshore is inspected daily by an inspector, and anything objectionable found is removed at once by the cleansing department.

House refuse is stored on the premises in the majority of houses in round galvanised iron bins with covers, provided by owners; we have no deep ashpits. Shop refuse, paper, &c., is stored in special bags hung upon brackets specially constructed for that purpose. The health department sees that these are provided, the brackets by the occupier and the bags by the cleansing department. Refuse in all large property is collected daily, in some parts of the town three times per week, some twice per week, and the remainder once per week. Fish offal is collected daily.

The streets are swept and cleansed by the cleansing department, salt water is used for swilling and watering streets, flushing sewers, gullies, &c. In the first week of August, 1913, 563 tons of house and trade refuse and 30 tons of fish offal was carried to the destructor.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

*From a paper presented at the Annual Congress of the Royal Sanitary Institute at Blackpool.

INJECTION OF CEMENT GROUT INTO WATER-BEARING FISSURES.*

[illegible]

The [illegible] water-bearing fissures [illegible] the sinking of shafts [illegible] the Catskill Aqueduct [illegible] the city of New York. This aqueduct includes a tunnel, deep pressure tunnel, reached by shafts [illegible] underground water was met. The contract for the [illegible] Company, this [illegible] known as the Rosendale [illegible] depth of from 80 to 500 ft., and is about [illegible] long. The engineers expected that considerable water would be encountered, but fortunately this was not the case except at one shaft, known as No. 4, which penetrated the rock at a junction between limestone and conglomerate.

Water-bearing fissures were encountered almost immediately. At a depth of about 200 ft. a flow of 1,500 gallons per minute was struck. The shaft then contained as many pumps as could be used, and it seemed impossible to sink it further. After vain efforts had been made to proceed, John P. Hogan, a division engineer of the Board of Water Supply, suggested that a consolidation of the fissures be tried. The process was also used for the first time in this country.

Since the shaft was partly full of water it was necessary to drill grout holes with a diamond drill. Platforms were placed on the timbers at the water level, the diamond drill was installed, and six 90-ft. holes were drilled in the bottom of the shaft. Several cubic yards of grout were pumped through these holes into the fissures, the drill casings being used for grout pipes. This largely cut off the flow of water from the bottom and sinking could then proceed. After that, water-bearing seams were grouted as soon as encountered, and the contractor was able to finish the shafts and tunnel within the contract time. Shaft No. 4 was a rectangular, timbered construction shaft with no concrete lining; consequently it was impossible to cut off any of the water coming in from above the point where grouting was first attempted. On this account large volumes of water had to be pumped until the tunnel was finally sealed.

At the next wet shaft the writer had to do with advantage was taken of the experience gained at shaft No. 4. At the second shaft, No. 4 of the New York City syphon, good progress was made until a depth of about 100 ft. was reached. The first hole drilled in the bottom below this depth struck a stream of water; the flow amounted to about 150 gallons per minute. This was plugged [illegible] that each of the twelve holes in the sump cut encountered the same stream of water.

[illegible] it was plugged with a tapered wooden plug. After all the holes in the sump had been drilled and plugged in this way, the grout connections were made one at a time, so as to restrict the flow of water into the shaft. Each connection was made with a piece of 2-in. or 2·5-in. iron pipe about 3 ft. long, threaded at one end and given a long taper at the other. The tapered portion was made rough on the outside by nicking it with a chisel. A heavy iron stopcock was screwed to the pipe, the tapered end wrapped in several thicknesses of burlap, the wooden plug removed from the drill hole and the tapered pipe driven in, the stopcock being left open. This was the most exciting and the wettest part of the job. After the pipe had been driven in hard the stopcock was closed.

THE GROUTING MACHINE.

In this case connections were placed in all the wet holes before grouting. The grouting machine or tank used on the aqueduct was the Caniff machine, in which the grout is mixed by air. It is built like an air lock with a door on the top through which cement, sand, and water are introduced, and has a 2-in. discharge opening in the bottom and air connections top and bottom. The discharge opening is connected to the grout hole by a heavy rubber hose. Another 2-in. stopcock is placed at the outlet of the tank, and a 2-in. by 1-in. tee is placed between the hose and the pipe attached to the pipe in the drill hole. Into the side opening of this tee a 1-in. stopcock is screwed.

The machine is installed at the bottom of the shaft, and is connected to one of the holes and also to the high-pressure air supply. The 2-in. stopcock on the machine is closed and the other is opened. The door in the top is opened, a sack of cement, three or four buckets of water, and (if the cavity to be filled is large) a sack of fine sand are poured in, the air connection at the bottom is opened and the air allowed to bubble through and mix the grout. Then very quickly the door is closed, the lower air connection is closed, and the discharge connection and the upper air connection are opened, and the air enters and drives the grout into the cavity. A man stationed at the 1-in. stopcock keeps opening it a crack; when air shows instead of grout he closes the 2-in. stopcock and the machine is recharged. If the cavity is open the charge is pushed in in three or four seconds. By working continuously more than 1,000 batches can be placed in twenty-four hours.

The grouting of the fissure was successful and sinking was resumed. About 50 ft. further down another water-bearing fissure was drilled into, and this, instead of being open, was filled with sand formed by the crushing of metamorphic gneiss due to folding; this sand was carried up out of the drilled holes in large quantities by the water. Grout will not permeate sand, and it was necessary to continue drilling holes and pumping in grout, increasing the pressure at the end from 100 to 400 and 500 lb. to the square inch. The sand was tamped so full of cement that when cut through it was compacted like sandstone and contained balls of grout from the size of a fist to as large as a man's head.

The most difficult grouting on the aqueduct was done on the Hudson syphon, which is a deep syphon tunnel under the Hudson river at a depth of 1,100 ft. below tidewater. The shafts were sunk by the city forces, after which the contract for the driving and lining of the tunnel and lining the shafts was let. About 150 ft. from the foot of the east shaft the heading cut a water-bearing fissure which flowed about 300 gallons per minute. The full flow did not develop until the cut was blasted. The problem then was to grout this flow against a hydrostatic pressure of 500 lb. per square inch, with no solid rock to which to make grout pipe connections. This problem was finally solved by the construction of a concrete bulkhead 8 ft. thick across the full section of the head. The concrete was mixed in proportions of 1:2:4, and was heavily reinforced with rails set into holes drilled laterally into the sides, roof and floor of the tunnel. Grout pipes leading into the fissure were set through the bulkhead. After the concrete had set for a week, grout was forced into the fissure, first by the pneumatic process with a high pressure air compressor, and finally by means of a high pressure plunger pump which forced water instead of air into the grout tank. Pressures were reached in this way up to 1,000 lb. per square inch.

In driving or sinking through rock containing a large number of seams carrying small quantities of water, it is not practicable to stop and grout each seam as described above. In this case it is advisable to increase the section of tunnel or shaft sufficiently to allow for a heavy concrete lining. Drains should be provided opposite all the water-bearing fissures to carry off the water while the lining is being placed. After the concrete has secured sufficient strength, the drains may be grouted. By a combination of these two methods it should be possible to penetrate any firm rock, no matter how much water it contains.

* From the Transactions of the American Institute of Mining Engineers.

Sewage Disposal at Lewes. The new outfall sewage works at Lewes commenced working recently, after a ceremonial "opening" held at the pumping station at Southeram. It was stated that the works were the result of ten years' labour of the Sewage Disposal Committee. The following statement shows the amount to be expended on the scheme: Amount expended, £38,095; estimated amount required to complete the works, £10,770; add 10 per cent for contingencies, £973; total, £49,838.

ADMINISTRATION OF THE NEW HOUSING ACT.

DEPUTATION TO MR. HERBERT SAMUEL.

On Friday morning last the President of the Local Government Board received a deputation of representatives of the National Housing and Town Planning Council, including the executive members of the committee—Councillor Harold Shawcross, J.P. (chairman), Rochdale; Alderman W. G. Wilson, J.P. (vice-chairman), Derby; Alderman J. P. Spencer, J.P. (Tamworth); Councillor T. R. Marr (Marr & Co., Manch. C. P. Lawrence (Co-partnership), Conmore; F. M. Elwood, J.P. (Ruislip Northwood Urban District Council), Mr. E. R. Abbott (Ruislip Northwood Urban District Council), Mr. Raymond Unwin, F.R.I.B.A. (Hampstead), Mr. B. Seebohm Rowntree, J.P., York, Councillor S. Shelton, J.P. (representing Federation of Building Trade Employers), Mr. Albert E. Cave (London), Mr. A. W. Shelton (Nottingham), and Mr. Henry R. Aldridge (secretary). Mr. Noel Kershaw, assistant secretary, Local Government Board, was also present.

The chairman and secretary briefly introduced the deputation, and placed before the President of the Board the following memorandum. The chairman specially emphasised the fact that the members of the committee were unanimously of opinion that the rate of interest for housing loans under the new Act was a point of fundamental importance.

DEPUTATION'S MEMORANDUM.

"We gladly recognise that the Government, acting through the Local Government Board, wish to do all within their power to stimulate the building of houses by local authorities and by public utility societies during the war period. We believe this policy to be wise on two reasons.

"(1) That the supply of private capital for financing building operations will be greatly restricted during the period, and there may be a great lack of employment in the building trade, with consequent distress.

"(2) That it will be better to keep the building trade supplied with useful work than to allow conditions of bad trade to arise with all the consequent waste of money on costly and more or less ineffective relief works.

"We believe that many local authorities will be willing to take action in regard to the building of houses where a shortage can be shown to exist, and that facilities given by the Government to secure this end will be welcomed and consequent action taken. Two points are, however, of fundamental importance—viz.:—

"(a) While recognising the difficulty which the Treasury may have in financing housing schemes at the present time, we are convinced that any proposal which involves the payment of interest by local authorities at a rate higher than was current before the war would meet with little response from them.

"(b) The procedure for granting housing loans should be the one familiar to local authorities—viz., for periods of sixty years for building and eighty years for land.

"We desire to add that, in the opinion of the majority of the members of our committee, it is most important that the Government should stimulate local authorities in undertaking housing schemes by making capital grants in aid of the expenditure upon such schemes. We also suggest that arrangements should be made for the granting of housing loans to public utility societies at rates of interest current before the war during this exceptional period, and that the proportion of the loan to the value of the property should be raised from two-thirds to nine-tenths. The Government may in making these loans in war time have to make some sacrifices—for example, the difference between the rate at which they can borrow and the rate at which they lend to local authorities. In return, we think the Local Government Board should stipulate for several special features in the various housing schemes submitted by local authorities. Thus we would strongly urge that wherever possible houses built in urban districts should be built under town planning conditions, with a limitation of houses to the acre of from twelve to sixteen. We would urge that in rural areas provision should be made for each house having a garden area of ¼ acre; or that, if it is decided to build on less than this area, in no case should there be more than eight houses to the acre, and that provision should be made for those tenants who wish to obtain extra land for allotments close to their homes. We think that local authorities should also be required to adopt a scheme of housing for example, the sizes of rooms should not be less than those recommended by the Small Holdings Committee, and three rooms in addition to the living room should be provided. We would press upon the Government the desirability, if this be possible, of allowing such houses to be built with concessions in the width of roads in a simple form of town planning scheme approximating to those to which the houses are to be built."

MR. SAMUEL'S REPLY.

Mr. Herbert Samuel, in replying, said that the great interest shown by the Government in the points raised by the deputation could be seen from the fact that the Government had, before adjourning on August 10th, passed a Bill providing for the issue of £4,000,000 for the purpose of housing. The Government had, of course, had to bear in mind that a point of fundamental importance in regard to housing loans under the new Act was that of the rate of interest for these loans. A conference to consider this point had been held, and at this he had met representatives of the Treasury and of the Public Works Loan Commissioners, the Secretary for Scotland, and other gentlemen advising him in the matter. As a result of this conference, and with the approval of the Committee on Urban Housing, recently appointed, he had sent a circular to the local authorities. In this circular he stated that it was the intention of the Government that such sums as might be made available under the new Housing Act should be utilised for the joint purposes of providing and improving housing accommodation for the working classes, and of preventing or mitigating unemployment in the building trades. The Treasury would be prepared, so far as circumstances might permit, to consider advances to local authorities of money for approved schemes of building which would meet the above objects at the rate at which the Government might be able to borrow. In regard to the proposal that loans should be granted at a fixed rate per cent (say 3½ per cent) during the war period, he wished to point out that no one could possibly forecast what the rates of interest would be for several years after the war. Many great nations were consuming capital at the rate of millions of pounds per day, and this would produce a scarcity of capital at the end of the war. If, in addition, we had in this country a trade boom, the rate of interest would be high as a result of the great demand for capital. In closing, Mr. Samuel again expressed his earnest desire to do all that he could possibly do to stimulate housing action by local authorities in this period of national need.

In the discussion which followed Mr. Samuel again made it clear that in cases under the new Housing Act the Government would lend local authorities money at the rate of interest which the Government had to pay, that the money thus lent would be lent for periods of sixty years for building and eighty years for land. He thought that, if at the end of the war period, or at subsequent periods, local authorities could borrow money at lower rates of interest, they would be allowed to use it to extinguish the loans granted during the war period. Mr. Samuel also stated that the Treasury had consented to the granting of loans to public utility societies for nine-tenths of the value of the property, as against the two-thirds provided for in the Act of 1909. The question of the rates of interest to public utility societies and the periods of the loan was, however, still under consideration.

Mr. Unwin and Mr. Shawcross raised points as to the possibility of securing the co-operation of local authorities and public utility societies for the purpose of building.

Mr. Samuel promised to consider these fully if Mr. Shawcross and Mr. Unwin would place before him in writing the precise schemes which they had in mind. In regard to the question of the planning of the land to be built on, he had already given consideration to this matter, and he proposed to communicate with local authorities at a later date. It had, however, been thought better not to deal with the question in the circular already issued.

Councillor Marr and Alderman Wilkins raised the question of the possibility of using part of the £4,000,000 provided for in the Housing Act for the purpose of grants in aid.

Mr. Samuel, in replying, stated that it was not the

[illegible] of the Government to use this £1,000,000 [illegible] [illegible] If time began to tell [illegible] [illegible] [illegible] undertake [illegible]

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is the Royal Automobile Club to be congratulated on the splendid response to the secretary's invitation to members to offer their services or the use of their cars to the War Office, when we hear that over 1,000 members have already enrolled? Is this a fair recent example of patriotism shown by those who are so often accused of keeping cars for the purpose of joy rides only?

• • • •

Is the Board of Agriculture or other Government Department taking steps to see that the corn crops of the country will be carried and stacked without delay? Would it not be possible to induce able-bodied men of means to spend their holidays in a healthy and pleasant form of recreation by assisting in this work? Would it not be possible in cases where horses have been commandeered by the military to carry the corn in hand-carts and stack the crops in the fields in which they have been grown?

• • • •

Why is it that the streets of London are in some districts so badly "named" in comparison with many provincial towns, and why cannot the use of the 6-in. white tiles with black lettering be more generally adopted in the Metropolis? Is not this description of nameplate the most visible, the neatest and the most lasting of all descriptions of nameplates? Has not the London County Council the necessary powers to affix these nameplates on any roads as they may select?

• • • •

Why is it thought necessary, in many cases throughout the country, to take up the existing "road formation" for the purpose of substituting a foundation when there is often a sufficient thickness of time and traffic-compressed old roadway to form an excellent foundation for a thin wearing crust of some suitable formation? Are there not many cases where time, labour, and unnecessary expenditure could thus be avoided?

• • • •

Why is it that there is a large and imposing statue of Brunel on the Thames Embankment and only a very small plaque of Bazalgette? Is it to be wondered that in a recently published guide book of London we are seriously informed that Brunel designed and carried out the Thames Embankment! What was the reason that Brunel was thus honoured by the London County Council whereas the great engineer who helped to make London habitable was ignored?

• • • •

Who can invent a comprehensive name for the method of construction of the road of the future, now that "macadamised" is a thing of the past? Will any of the following suggestions quite meet the case? "Compressed," "Hoodeyised," "Gladwellised," "Brodieised," "Drylandised," &c., &c.? As none of these appear to be very applicable, how would "Bituminised" meet the case?

• • • •

What do surveyors think of the "Shock-shifter" wheel? Are there not possibilities, in an axle of this description, that the blow on the road from the wheels of rapid, heavy motor vehicles will be transferred into a rolling motion, and is this not "a consummation devoutly to be wished"? Would not the introduction of such wheels, if they effect this transference, tend to preserve our roads from the hammering action to which they are now subjected?

• • • •

Is it not rather surprising to learn that in three of the large Yorkshire manufacturing towns there are still no fewer than 46,865 privies in existence? Does it not seem to be almost incredible that with our modern sanitary knowledge such "obscenities" should still be permitted to remain, and should not steps be taken to convert these mediæval contrivances into more modern appliances?

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain.
Each man's opinion freely is his own
Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act ii, 2.

FAST TRAFFIC: ITS EFFECT ON ROADS, AND THE REMEDY.

To the Editor of THE SURVEYOR.

SIR,—Editorially, in your issue of June 19th last, you invited criticisms of an article in the same number by "Contributor" entitled "Fast Traffic: Its Effect on Roads, and the Remedy."

The writer wishes to submit now two comments. First, he desires to compliment both the author and the editor on their ideas as presented in this connection, and to say that he agrees heartily with the editor in his commendation of a study of "Contributor's" article by highway engineers especially, and a public presentation of their views in the matter. Personally he agrees with the editorial comments in the matter.

The second remark he would like to make now is this: He regrets that, although "Contributor" emphasises the point that the effect of vehicles on the road surface is largely affected by the speed, and notes the fact that the average speed of vehicles on roads generally has greatly increased in the last few years, he nevertheless (in the second instalment of his article, July 3rd) falls back on a criterion of wear based on utter neglect of speed. He refers to tonnage "per yard of width" that "has passed over the road since the crust was laid down," but there is no statement to show whether this passage was slow or fast. To the mind of the writer, it may make all the difference in the world as to many of the deductions thereafter to be drawn.

The writer has endeavoured before to bring this matter of the effect of speed of vehicles to the attention of highway authorities, and on March 10, 1911, THE SURVEYOR published an article by him attempting to demonstrate the importance of its consideration, and suggesting a way therefor. The particular point now desired to be emphasised by the writer is that, apparently, although the effect of speed is generally recognised in the problem, sufficient provision for its recognition has not yet been generally made. The French system of computing traffic counts makes no provision for its inclusion. That of the British Road Board does include consideration of the weight of vehicles, but apparently none of their speed, and this is most regrettable in view of the newness and importance of its work. A host of other recorders (including, evidently, "Contributor"), while probably willing to admit an effect by speed, are accumulating information which later may be found to be far less valuable generally than it might be were the compilations, now begun to be made and published, to include a reduction by a factor which should take into consideration the speed, as well as the weight, effect on the particular crust in each case. Later, circumstances may then prevent the desired reduction in many cases, and the value of the published summaries thus be then less than zero.

The importance of proper comparisons of traffic conditions probably does not need to be re-argued here, as the awakening among both engineers and laymen to the dependence of the solution of many of the problems now pressing in highway work, and so clearly resting their answers on comparisons of the traffic, has recently been so general. The crux of the situation seems to be the division of a proper unit of measure of traffic.

The writer hopes that such competent parties as the editor and "Contributor" have shown themselves to be for considering the science of highway engineering may be able, with others, to give this matter the prompt attention he feels its importance warrants.—Yours, &c.,

W. W. CROSBY.

Baltimore, Maryland.
August 13, 1914.

The War and Sewage Disposal Schemes.—At a special meeting of the West Riding Rivers Board at Wakefield recently it was resolved to ask all local authorities having sewerage or sewage disposal schemes in progress or in contemplation to proceed with the work as soon as possible, so as to provide useful employment in their respective districts. It was also decided to ask the Local Government Board to expedite all schemes submitted to them.

The Surveyor

And Municipal and County Engineer.

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SOME RECENT PUBLICATIONS.*

A Glossary of Road Terms. By H. Percy Boulnois, M.Inst.C.E., &c. Price 2s. nett. London: St. Bride's Press, Limited.

The author of this useful glossary seems to have approached his difficult task with three main ideas. In the first place he has provided short definitions of certainly nearly all the words which are, generally or locally, applied to things and processes used in road making and maintenance. Many of these words have ordinary meanings, apart from road work, and in such cases the author gives, of course, only the special meaning. In the second place, the glossary includes a number of terms which are not specially applicable to road work, but are, as it happens, often used in connection therewith—words such as "crude," "crumble" and "sediment." Thirdly, Mr. Boulnois has included a considerable number of words relating to subjects which have a bearing upon road matters, these including some chemical terms and a large number of topographical words. For the most part the definitions given in these three classes are adequate and correct, and the range is so great—from scientific terms to local or slang words—that the glossary should prove exceedingly useful to all grades in a road staff, from the chief engineer of a county to the ganger in charge of half-a-dozen men.

In his preface the author writes: "I still feel that the glossary is far from complete, and I hope that I may receive some further suggestions for improvement in a second edition, which—should the demand justify it—may follow this first attempt." In view of this statement, and in the hope that familiarity with the glossary in its present form will lead road engineers to demand, and to contribute suggestions for, a second edition, the present review may, perhaps, not unfittingly take the form of a friendly but somewhat searching criticism. Let us consider, then, what are the most notable limitations of the book with respect to each of the three classes of words which have been recognised in it as explained above. As regards words which are specially road terms, it may be suggested that the definitions might with advantage be expanded in a good many cases. The definition, for instance, of "pun," "pug-mill," "scarify," "drag," and other terms are too short to give a clear idea of the meaning in each case. In the case of "crust" and "road crust" the attempt to condense the explanation of the meaning results in this, that the essential idea expressed by the word "crust" is altogether missed. The term was deliberately introduced to designate the whole thickness from subsoil to surface, and it is too useful a term to be frittered away into various less definite meanings. As regards the second of the classes, general words often used in connection with road work, some of these seem to be unnecessary, and in a few cases the definitions are inadequate. Examples of inadequate definitions are "depot," "aqueduct," "invert," "lagging" and "derrick," the last-named being defined as "a boom supported by posts and stays," though neither "boom" nor "stay" is defined. In the third class there are limitations of two kinds to the scope and usefulness of the definition. In the first place geological terms and terms relating to certain other subjects have been left out altogether, and, in the second place, the scope of the glossary as regards the subjects introduced is notably and arbitrarily limited. If, for instance, it was thought desirable to include topographical terms such as "dell," "saddle-back," "mere" and "ravine," it was surely of equal importance to include a number of other terms which are not to be found in the glossary, such as "glen," "dale," "spur" and "pass." Similarly, we find that the terms relating to law and administration are not more important than other terms under these heads which do not appear in the glossary.

As regards geological words, Mr. Boulnois states in his introduction that he contented himself "with scrupulously following the names settled by the Engineering Standards Committee in this direction." It is a pity that he has done this, and not only because he widens the scope of the wrong done to the English language by the committee, but also because one result is that his glossary is without a single hint as to the differences between such rocks as granite, basalt and limestone. We find, too, this anomaly, that the expression "trade name" is applied to "Akonia" and "Quarrite" on the one hand, and to "limestone" and "schist" on the other hand. All we are told about "shale" is that it comes under the trade name of "schist." It is, indeed, to be regretted that Mr. Boulnois has not included in his glossary suitable definitions of rocks and rock-forming minerals.

A few criticisms of the definitions themselves may now be offered. A number of them are not sufficiently explanatory, or do not convey the whole of the essential information. Examples of these are "briquette," "ferro-concrete," "off side," "street," "tare," and "trunk roads." "Silica," we are told, is "silex or flint." Turning to "flint," we find that it is "a variety of chert found in the chalk." Looking up "chert," we find that it is "a road-making rock coming under the trade name of flint, as settled by the Engineering Standards Committee." Some of the definitions are somewhat vague, such as "breaking track" and "pockets," and some have been included for no apparent reason. Examples of these are "decay," "charge," and "immerse." If "immerse," why not "swim"? Lastly, there are some terms which, it may be suggested, may be marked down for correction in a future edition. A "ditch" is an *open* drain; a "revetment" is not a wall; a "watershed" is not, correctly, an area; a "rimer" is not a boring tool, but a tool for making a bored hole the right size and taper; "momentum" cannot be measured in units of distance; and a rubble wall *may* be built in courses.

Now, the greater part of the above criticism has been so directed as to suggest amplification of the glossary—first, by the inclusion of all terms of real usefulness with respect to road work, and derived from subjects bearing upon the engineering and administration of roads, and, secondly, by the extension of many of the definitions so that they may clearly convey the natures of the substances described in terms acceptable to the geologist and chemist. In the meantime, it is not too much to say the glossary, in its book form, embodying many suggestions and amendments, should be in the possession of everyone who has anything to do with road engineering.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Road Maintenance in Newcastle-on-Tyne.—The city engineer of Newcastle-on-Tyne, Mr. W. J. Steele, states in his annual report that the approximate total length of highway now maintained by the corporation is 253 miles. The cost of maintenance per mile, exclusive of debt charges, varies with the amount of traffic, but over the whole length, and after reducing the total mileage to a figure which makes the back streets equal in width to the front streets, it is about £131, whereas the average cost in fifteen of the large towns is £179.

THE WAR.

BRITISH MANUFACTURERS' OPPORTUNITY.

[illegible]

markets in certain lines of trade in which German [illegible]

"The present safety of the trade routes, coupled with the [illegible] His Majesty's Government to facilitate the continuance of [illegible]

It is [illegible] lead to the permanent advantage of British trade.

With a view to assisting British manufacturers and traders in this matter, memoranda have been prepared giving information in regard to possible developments in certain important trades. Any British manufacturer or merchant who desires to be [illegible] openings affecting his particular business should put himself in communication with the Director of the Commercial Intelligence Branch of this department, Basinghall-street, E.C., who will be prepared to give any further particulars as possible respecting names of buyers, rates of import duty, &c., or to make special enquiries through H.M. Trade Commissioners and the Trade Correspondents of the Commercial Intelligence Branch in the British self-governing dominions, India, and the colonies, and protectorates, or through British Consular officers in neutral foreign countries."

LOCAL AUTHORITIES AND THE WAR.

St. Pancras Borough Council will pay his wages to all men on active service.

A member of the staff of the Belgravia Urban District Council, who has gone to the front, is to receive 13s. 6d. per week, and his job is to be left open.

Coventry Town Council will keep open posts of employees who go on active service and pay 10s. a week to the direct dependent and 1s. weekly for each child.

Nottingham Corporation have decided that the widowed mothers of corporation employees on service should be granted similar payment to that given to the wives.

Camberwell Borough Council have resolved that the position of every employee who serves with the colours shall be kept open, and full salary or wages paid while on service.

Norfolk County Council have decided that the places of the men on active service shall be filled temporarily. The question of allowances has been referred to the Finance Committee.

Holmfirth Urban District Council have agreed to pay the dependents of a national reservist who has been called on service 10s. a week in addition to the Government allowance of 12s. 10d.

The precedent of the Boer War is to be acted upon with respect to the treatment of the families of men of the Glasgow Corporation called to join the colours until a committee has reported on the subject.

The city engineer of Wakefield, Mr. J. P. Wakeford, has received instructions to submit a scheme for work in connection with the roads of the city, towards which the Road Board have promised substantial grants.

Forty employees of the Hackney Borough Council have gone on active service—ten from the town hall staff, and thirty from the outside workers. The borough council intend to look after the dependents of the men.

The City of London Corporation have decided to follow the plan of the Government in the case of employees called up for service, and pay full salaries to married or unmarried men alike. Pay or allowance will, however, be deducted.

All committees of the Gloucestershire County Council [illegible] paid weekly wages, and [illegible] the next meeting of the council, to pay half wages to such of [illegible]

Hammersmith Borough Council have resolved that [illegible] will make up their full salaries or wages; also that the places of those called to the colours shall be temporarily filled.

From a report of the borough surveyor, Mr. J. [illegible] highways staff of the Cambridge Corporation have been [illegible] Committee.

[illegible] caused by the war, the urban district council on Tues- [illegible] the Westmonte estate, North Finchley, at a cost of £26,450. The houses are to be let at rentals of 7s. 6d. and 8s. 6d.

An emergency Local Government Board inquiry has been held at High Wycombe to consider an application for £11,200 for the erection of fifty-four workmen's dwellings on land purchased from the Marquess of Lincolnshire for £880. The scheme will facilitate local employment during the war.

Walton Urban District Council have instructed the surveyor, Mr. D. Waterhouse, to proceed with all possible speed with the road scheme initiated by the county council, and it has also been agreed to seek power to borrow £5,000 on account of the water-pumping contract, and £3,054 for sewer reconstruction.

Brentwood Town Council have agreed to pay their employees called up to service the difference between the Government allowances and their ordinary pay.

Having regard to probable unemployment caused by the war, it has been resolved to ask the county council to expedite their decision in regard to the proposed new science and art schools.

St. Austell Rural District Council have adopted a report of the committee appointed to consider the question of relieving unemployment during the war, recommending road widenings, the construction of short pieces of new road, and the cutting off of corners. The committee have been authorised to obtain the necessary details and estimates, and take steps to obtain grants from the Road Board.

So far there is no widespread unemployment in Sheffield, but plans for relief works are ready for putting into operation. Street widening schemes and building schemes for the improvement of Sheffield will be put in hand, and the work will be carried through under the direct supervision of the corporation officials. For many of these schemes the city had the consent of the Local Government Board before the war broke out.

It was stated at a meeting recently of the Hornsey Town Council, that the borough surveyor, Mr. E. J. Lovegrove, had completed a list of council works that could be put in hand. These included the making up of roads, the rekerbing of Archway-road, and the construction of a sewer at Coppetts-road. Several of the schemes had been approved by the council, and the latter work, which was estimated to cost £1,800, awaited the sanction of the Local Government Board. —Eleven employees of the council have been called to the colours, and it has been decided to make up their full wages.

The council of the Society of Architects, at a meeting on August 20th, unanimously decided to support, by every means in its power, the movement initiated by the Royal Institute of British Architects, and to place at the disposal of the Architects' War Committee the society's premises and staff at Bedford-square for the use of any of the sub-committees. They further voted a first grant of 100 guineas as a contribution to a fund to be formed for providing paid work for architects whose means of livelihood is stopped by the war, and undertook to appeal to members of the society and their friends for generous contributions towards this fund.

Housing (Ireland) Bill.—In the House of Commons on Tuesday a Bill to extend to Ireland the provisions of the Housing Act, passed this Session, was read a second time.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. N. S. Jeffrey, of Darlington, has chosen the following books in respect of the awards of the premium for July which was awarded to him:

"Practical Sewerage and Sewage Disposal," by H. C. H. Shenton (Local Government Journal Office).

"Municipal Engineering," Molloy (Answers to Questions Office, St. Bride's Press, Limited), and

"A.B.C. Three-Frame Locomotive," by C. E. Woodward (Spon).

These have been duly sent to him.

QUESTIONS.

This week answers are invited to the following questions:—

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. (King.)

418. Iron Curved Roof. Show details of an iron curved roof of 40-ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G. F., *Buckfastleigh.*)

419. Practical Mathematics.—Explain a graphical method for solving simple simultaneous equations, and give a worked example.

421. Reactions of Beams.—Show how to find graphically or otherwise the pressures on the two supports of a horizontal beam which is loaded at any given points.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

416. Concrete Floor.—Give two sections of a reinforced concrete floor for a span of 30 ft., showing the sizes and weights of the girders, and giving the necessary calculations. (K. G. F., *Buckfastleigh.*)

The span (effective span) is given as 30 ft., and we will assume that the beams are 10 ft. centre to centre, and also that the floor is for a warehouse to carry a load of 200 lb. per foot super. The floor slab may be considered as a continuous beam, as it passes over more than three spans, the bending moments being taken as $\frac{WL}{24}$ at the centre of the beam and $\frac{WL}{24}$ over the supports. The main beams will be considered as supported only, and BM = $\frac{WL}{8}$.

Using the notation adopted by the R.I.B.A. Committee's second report—viz.:—

W = total working load on beam in lb.
L = effective length of beam in inches.
n = depth of axis from the extreme compressive.
d = depth of beam in inches (effective).
c = compressive stress to be allowed in concrete = 600 lb. per sq. in.
b = breadth of beam in inches, or breadth of flange in T beams.
a = arm of resisting moment or lever arm $= \left(d - \frac{n}{3}\right)$ for slabs.
At = area of tensile reinforcement in inches.
t = tensile stress in steel in lb. per sq. in. = 16,000.
ds = total depth of beam.
m = ratio of elasticities of steel and concrete = 15.
r = ratio of tensile reinforcement $= \frac{At}{bd}$.
br = breadth of rib in T beams (in inches).
s = intensity of shearing stress in concrete = 60 lb.
s_s = " " " " steel = 12,000 lb.

The depth of the neutral axis may be obtained by the formula

$$n = \frac{mcd}{t + mc} = \frac{15 \times 600 \times d}{16,000 + 15 \times 600} = \frac{9}{25}d$$

$$\therefore \text{a lever arm } a = d - \frac{n}{3} = d - \frac{3}{25}d = \frac{22}{25}d$$

$$\text{Compressive resistance} = \frac{c}{2}b$$

and moment of compressive resistance

$$= \frac{c}{2}b \times a = \frac{c}{2} \times \frac{22}{25}d$$

$$\frac{600}{2} \times \frac{22}{25}b \times \frac{22}{25}d = 95{\cdot}4\,b\,d$$

Compressive resistance = tensile resistance

$$\frac{c\,b\,n}{2} = A_t\,t$$

$$At = \frac{c\,b\,n}{2\,t} = \frac{600 \times b \times \frac{22}{25}}{2 \times 16,000} = 0{\cdot}0675\,b\,d.$$

Taking the weight of reinforced concrete as 150 lb. per foot cube, and the depth of the slab being assumed at 6 in., its weight = 75 lb. per foot super.

The total load on the slab will therefore be 275 lb. per foot super.

$$BM = MR$$

$$\therefore \frac{WL}{12} = 95{\cdot}4\,b\,d^2$$

Considering a 12-in. length, then,

$$\frac{275 \times 10 \times 10 \times 12}{12} = 95{\cdot}4 \times 12 \times d^2 \text{ in.}$$

$$\therefore d^2 = \frac{275 \times 10 \times 10 \times 12}{12 \times 95{\cdot}4 \times 12} = 23{\cdot}16.$$

$\therefore d = 5''$ nearly.

or a total depth ds of 6 in. to allow for wear of surface, and for covering reinforcement.

$$At = 0{\cdot}0675\,b\,d.$$
$$= 0{\cdot}0675 \times 12 \times 5 = 4{\cdot}050 \text{ sq. in. per ft. run.}$$

A $\frac{5}{16}$-in. sq. rod has an area of 0·0977 sq. in. Four $\frac{5}{16}$-in. rods at 3-in. centres per foot run give an area of 0·3908 sq. in. This area will be found to give a stress upon the steel of just under 16,000 lb. per square inch, being caused by the depth of the slab being slightly more than the calculated depth. The rods would change from the bottom to the top of the slab at the points of contra flexure—that is 0·212 of the length of the beam from the supports = 8·66 ft.

Fig. 1 shows a cross-section of the slab as calculated above. The main beam may be considered as a T beam, the breadth of the table being taken as recommended in the R.I.B.A. Committee's second report—*i.e.*, the flange should not exceed—

(1) One-third of the length of the beam.

(2) Three-quarters of the distance from the centre to centre of the ribs.

(3) Fifteen times the depth of the slab.

In this case 1 = 10 ft., 2 = 7 ft. 6 in., 3 = 7 ft. 6 in., the breadth of the slab is therefore taken as 7 ft. 6 in. Assuming that the neutral axis falls at the bottom of the slab, $ds = n = 6''$.

$$n = \frac{4}{9}d$$

$$\therefore d = \frac{25 \times 6}{9} = 16{\cdot}5.$$

$$BM = MR$$

$$\therefore \frac{WL}{8} = 95{\cdot}4\,b\,d^2$$

Taking the weight of the rib as 200 lb. per foot-run, we get—

$$\frac{WL}{8} = \frac{30 \times 275 \times 10 \times 30 \times 12 + 200 \times 30 \times 30 \times 12}{8} = 39575{\cdot}0$$

$$\text{and } 95{\cdot}4\,b\,d^2 = 95{\cdot}4 \times 90 \times 16{\cdot}5 \times 16{\cdot}5$$
$$= 2,284,000$$

The difference between these = 1,673,500 inch lb. must be taken up by the steel in compression.

The stress allowable on steel in compression = mc = 9,000 lb. per square inch.

$$\therefore \text{steel in compression required} = \frac{1673500}{9000 \times 16{\cdot}5}$$

$$= \frac{1673500}{9000 \times 16{\cdot}5} = 12{\cdot}80 \text{ sq. in.}$$

Further, $1\frac{1}{4}$ rods give an area of 12·922 sq. in.

$$A \times s \times a = BM$$

$$\therefore A = \frac{BM}{s \times a} = \frac{3957500}{\frac{22}{25} \times 16.5 \times 16000} = 17.01 \text{ sq. in.}$$

Two $1\frac{1}{4}$-in. rods give an area of 17·671 sq. in.

The width of the rib should not be less than one-fifth of the width of the flange $= \frac{90}{5} = 18$.

This is not an economical design as the proportion of steel is too large. If, however, the depth of the rib is increased, the neutral axis falls below the bottom of the slab, and involves rather complicated formulæ. These formulæ and their derivation are given fully in the R.I.B.A. Committee's second report, Appendix I.

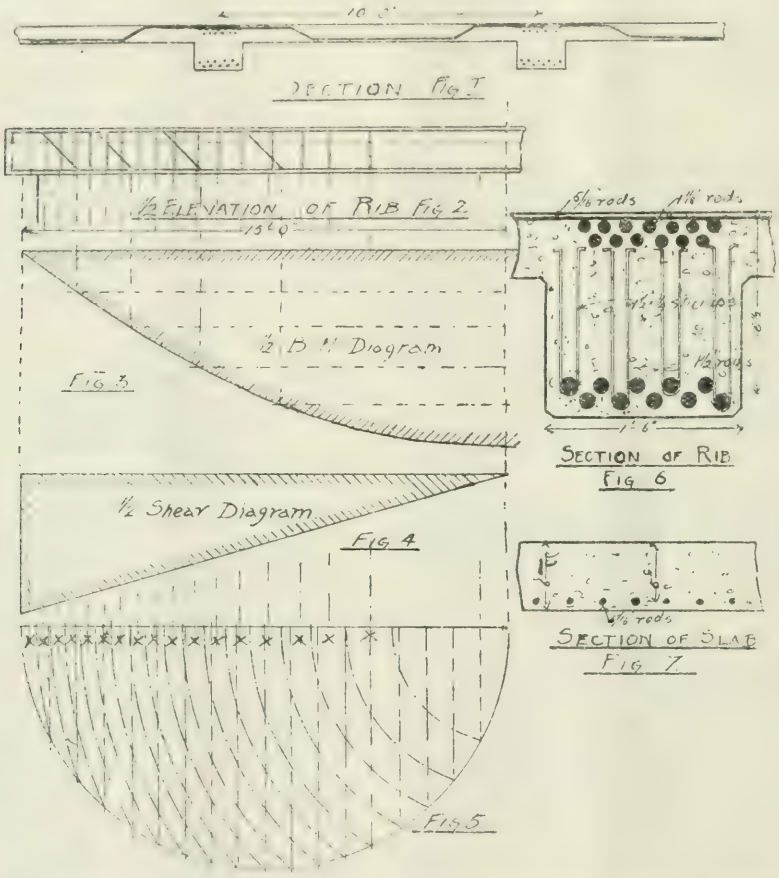
$$A = \frac{22}{25} \times 16.5 \quad s = 12{,}000$$

$$\therefore as = \frac{663750}{\frac{22}{25} \times 16.5 \times 12{,}000} = 46.07 \text{ sq. in.}$$

Eight of the last rods provided to take the tensile stresses can be turned up at the ends and made to take part of the shear stress.

Eight $1\frac{1}{4}$-in. rods have an area of $8 \times 17.671 = 141.368$ sq. in., and if turned up at an angle of 45 deg. have an effective area of $\sqrt{2} \times 141.368 = 199.99$ sq. in.

This leaves an excess of 26·08 sq. in. to be provided in the form of stirrups. Using $\frac{1}{2}$-in. × $\frac{1}{8}$-in. flat iron in sets of four, we get an effective area



Shear Stresses.—The resistance of the concrete in the rib to shear is so small that it may be neglected. The shear members may be calculated by the formula—

$$as\ Ss = \frac{Sp}{a}$$

$$\therefore as = \frac{Sp}{Ssa}$$

Where as = area of steel resisting the shear
Ss = safe stress upon steel in shear = 12,000 lb.
S = shear stress at any vertical section
p = length of section
a = lever arm of resistance moment
Consider $\frac{1}{2}$ of the beam
The shear diagram is a triangle and the maximum shear = $\frac{1}{2}$ W

$$\therefore \text{total shear on beam } Sp = \frac{\frac{1}{2}W}{2} \times \frac{l}{2}$$

$$= \frac{(275 \times 30 \times 10) + (260 \times 30)}{4} \times \frac{30 \times 12}{2}$$

$$= 3{,}982\,500$$

of $1\frac{1}{2}$ in. to each set, the number of sets required is therefore $\frac{26{\cdot}08}{1\frac{1}{2}} = 17{\cdot}3$, say eighteen sets. The points at which the tension rods may be turned up is most easily found by plotting the bending moment diagram to scale and dividing it into five equal depths (the number of points at which rods are to be turned up), and projecting these points, as shown in Fig. 3. The method of spacing the shear members for a uniformly distributed load is shown in Fig. 5. Describe a semi-circle on half the beam length, and divide the diameter into the same number of spaces as there are sets of shear members, and projecting at right angles to the diameter to cut the circumference. With the centre of the beam as centre turn these points back to the diameter. One set of stirrups should then be placed at the centre of each of these divisions. Fig. 6 shows a large scale and section of the rib, and Fig. 7 a section of the slab at the centre of its span. (J. A. R., *Faversham.*)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Harwich T.C. (August 27th. Mr. H. A. Chapman). £2,140 for the purpose of a scheme under Part III. of the Housing of the Working Classes Act, 1890, for the purchase of land and the erection of workmen's dwellings.—The town clerk, Mr. A. J. H. Ward, stated that the plans for the scheme had been got out by the borough surveyor, Mr. F. Harold French. It was proposed to erect houses to be let at 7s. per week, including rates and taxes. The borough surveyor stated that the accommodation provided on the ground floor consisted of a living-room, scullery, and in the yard, coal-house, &c. Upstairs there were three bedrooms, the largest being 13 ft. by 7ft. He considered the houses the best type to meet the needs of the neighbourhood, and he did not anticipate any trouble in finding suitable tenants. He knew of no vacant cottages in Harwich that were fit for habitation.

Hull T.C. (August 20th. Dr. A. S. MacNalty and Mr. R. G. Hetherington).—£14,438 for the erection of a sanatorium and hospital, on the Cottingham Castle estate, for the treatment of cases of tuberculosis; also an application for a capital grant of £10,800 from the Government towards the cost. It was stated that at present the corporation had accommodation for twenty-five patients, and it was intended to provide 120 beds in the new sanatorium. Alderman Aykey, chairman of the Health Committee of the corporation and of the Insurance Committee, explained that the contractors for the administration block had withdrawn their tender, but the Health Committee, if they failed to get another tender at the same price, intended to do the work themselves, desiring to carry out their obligations and to provide employment for Hull workers at this time. Mr. Hirst, city architect, said the corporation could carry out the work without any extra expense. In getting out the quantities he had taken into account the wages course.

Mytholmroyd U.D.C. (August 6th. Mr. F. H. Tulloch).—£1,000 for works of water supply.—It was explained that it was proposed to keep in use the present main to the Hebden Bridge boundary and lay a new main from Upper Foot, which was the boundary of the Luddenden Foot Council, to White Lee-terrace. For a considerable number of years the council had taken water in bulk from the Halifax Corporation through the Hebden Bridge mains, but the supply was not satisfactory. At the time the existing arrangements were made that was the only available source of supply. After careful consideration, they decided to take water in bulk from Halifax at Upper Foot. An agreement had been entered into and water was in future to be supplied through meter in bulk at Upper Foot. To carry out the new arrangement it was necessary to lay a 6-in. main. The council had only until September 30th, and it had thus been necessary to start with the work.

Oughterard (Galway) R.D.C. (August 12th. Mr. A. D. Price).—£3,056 for sinking and enclosing forty-five wells in the Lattermore district.—The engineer, Mr. Edward O'Malley, gave evidence of the proposed cost and location of the different wells throughout the entire district, and other witnesses, including the medical officer of health, Dr. Edmond Hearne, stated that there was great need for the wells, and that the existing water supply was insufficient and of poor quality.

Rotherham R.D.C. (August 22nd. Mr. M. K. North).—£2,442 for street improvements at Aston Swallownest, Bramley, Brampton-en-le-Morthern, Martin and Treeton.—The works, it was stated, were necessitated by the development of the district owing to the sinking of large collieries, and the consequent increase of traffic on local and district roads.

Swanage U.D.C. (August 13th. Mr. W. O. E. Morice-Kingsley).—£8,250 for the purpose of purchasing land overlooking the promenade, to be used as a recreation ground.—It was stated that an agreement had been reached with Mr. J. E. Mowlem, owner of the greater portion of the land it is proposed to purchase. The surveyor, Mr. W. H. Pearce, stated that the council intended to keep the two houses on the estate for the present.

APPLICATIONS FOR LOANS.

Abingdon T.C.—£1,000 for the extension of water mains and the purchase of water meters.

Billinge U.D.C.—£600 for water main extensions.

Cambridge T.C.—£3,000 for the erection of cottages.

Eastbourne T.C.—£60,545 for a housing scheme.

Kesteven C.C.—£2,202 for new buildings and alterations to existing buildings.

Nuneaton T.C.—£350 for a public convenience.

Rainford U.D.C.—£2,500 for workmen's dwellings.

Rawtenstall T.C.—£3,500 for the extension of the boiler house at the electricity works, and £600 for a bowling green.

Redruth R.D.C.—£4,250 for the St. Day water supply scheme.

Settle R.D.C.—£900 for works of sewerage.

Weymouth T.C.—£165 for walling and road work.

LOANS SANCTIONED.

Brampton R.D.C. £140 for works of water supply.

Kinsale R.D.C. £1,444 for an improvement scheme.

Northwich R.D.C.—£1,352 for the erection of working class dwellings.

Shipley U.D.C.—£1,295 for the extension of the sewage works.

Skelmersdale U.D.C.—£12,200 for a sewage disposal scheme.

Southend T.C.—£365 for sewerage works.

Spalding R.D.C. £1,375 for the erection of cottages.

Whickham U.D.C. £1,364 for the Dunston sewerage works.

Woking U.D.C.—£300 for the purchase of land for road improvement.

FORTHCOMING INQUIRIES.

	£
AUGUST.	
31.—**Blaydon.** For private street works (Mr. R. H. Bicknell)	700
SEPTEMBER.	
1.—**Ashington.** For works of water supply (Mr. R. H. Bicknell)	5,000
1.—**Dewsbury.** For the purchase of a motor fire tender (Mr. M. K. North)	590
1.—**Gosport.** For road construction (Mr. F. H. Tulloch)	2,000
1.—**Longbenton.** For private street works (Mr. R. H. Bicknell)	5,000
1.—**Lowestoft.** For works of sewerage (Mr. A. W. Brightmore)	11,120
1.—**Nelson.** For the provision of a refuse tip (Mr. H. R. Hooper)	21,500
1.—**Skipton.** For works of sewage disposal (Major J. Stewart)	8,700
1.—**Southend.** For the electricity undertaking (Mr. T. C. Ekin)	60,000
2.—**Aldeburgh.** For the reconstruction of a quay (Mr. A. W. Brightmore)	1,000
2.—**Blyth.** For burial ground extension (Mr. R. H. Bicknell)	1,000
2.—**Bradford.** For the purposes of a recreation ground, steam motor wagon, vacuum gully emptier, and public baths (Mr. M. K. North)	7,620
2.—**Brighouse.** For works of sewerage and paving, and the provision of automatic clock controllers for street lamps (Mr. H. R. Hooper)	3,083
2.—**Maidstone.** For the provision of office accommodation and a boiler (Mr. T. C. Ekin)	2,316
2.—**Ulverston.** For the purpose of offices (Major J. Stewart)	850
2.—**West Parley.** For the provision of a parish hall (Mr. F. H. Tulloch) ...	600
3.—**Cockermouth.** For works of sewerage (Major J. Stewart)	260
3.—**Docking.** For the erection of dwellings (Mr. Courtenay Clifton)...	1,150
3.—**Keighley.** For the electricity undertaking (Mr. H. R. Hooper)	16,700
3.—**Ossett.** For road widening (Mr. M. K. North)	311
1.—**Aspatria.** For works of sewage disposal (Major J. Stewart)	1,750
1.—**Sunderland.** For the electricity undertaking (Mr. H. R. Hooper)	62,000

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

[illegible]

BUILDINGS.

Burnley T.C.—It is proposed by the Education Committee that [illegible] at an estimated cost of £26,000.

Coventry T.C.—The council have agreed to proceed at once with the construction of a new storage reservoir at Coundon. As far as possible the work will be carried out by the direct employment of labour.

Denbighshire C.C.—It has been agreed to ask the Government to reconstruct Waterloo bridge, an important link in the main route between London and Holyhead.

Guisborough R.D.C.—An intimation has been received from the county council of their intention to build a stronger and wider bridge at Dunsdale, at an estimated cost of £1,200.

Huddersfield T.C.—A scheme for the erection of public [illegible] at Cambridge-road [illegible] under consideration.

Nelson T.C.—A scheme for the provision of public [illegible] has been [illegible] £11,000.

Taunton T.C.—The tender of the British Steel Piling Company, at £[illegible], has been accepted for works of piling on the gasholder field at French Weir. The council have approved the plans and specification of the borough surveyor, Mr. D. Edwards, for a house for the manager of the sewage disposal works, at an estimated cost of £450.

Tyrone C.C.—The council plans for the purchase of Dungannon House [illegible] for the purpose of a county [illegible] that the estimated cost is £3,200. It is proposed that the present buildings should be used for the nursing staff and for administrative purposes, and that a pavilion containing [illegible] wards to accommodate twenty-eight patients should be erected.

HOUSING AND TOWN PLANNING.

Bulkington U.D.C.—As the result of a letter from the Local Government Board the council have decided to expedite the inspection of the local housing conditions.

Coventry T.C.—A telegram has been received from the Local Government Board authorising the council to proceed with the erection of 100 houses for the tenants to be displaced by the Leicester-street widening improvement, and stating that the usual local inquiry would be dispensed with. It is hoped to [illegible] the latter of June.

Dalkey (Co. Dublin) U.D.C.—A site, consisting of 5 acres on the Carysfort road, has been secured for the purposes of a housing scheme. The cost was £1,270, and it is subject to a ground rent of £5 a year. It is proposed to erect thirty-three houses at a rental of 7s. 6d. per week, and to utilise the remainder of the land as a park and playground. Each house will contain five large rooms, with hot and cold bath. The estimated cost of the scheme is £10,000.

Eastbourne T.C.—It has been agreed to carry out a housing scheme on land belonging to the Duke of Devonshire, at an estimated cost of £60,000. The borough surveyor, Mr. A. E. Prescott, reports that the agent of the Duke has accepted the two following schemes: Archery site—For the provision of seventy-seven semi-detached houses and seventy-seven terraced houses at an estimated rental of 7s. 5¾d. each per week. Victoria-drive—For the provision of eighty-two semi-detached houses at an estimated rental of 7s. 6¼d. each per week.

Hemsworth R.D.C.—The council have adopted an [illegible] for the erection of between 100 and [illegible] in Hemsworth and [illegible] districts.

Holmfirth U.D.C.—The architect, Mr. P. N. Brown, has received instructions to submit a plan of two blocks of five houses each, part of a scheme of thirty-three houses which it is proposed to build.

Midhurst R.D.C.—The Local Government Board have expressed general approval of a scheme for workmen's dwellings, which is estimated to cost £780.

Sheffield T.C.—The Estates Committee has received authority to prepare a scheme for the complete development of the Wincobank estate for artisans' dwellings, and present a report as soon as possible.

PARKS AND OPEN SPACES.

Coventry T.C.—The city engineer, Mr. J. E. Swindlehurst, has received instructions to prepare a scheme for the enclosure and improvement of Gosford Green, and to make inquiries as to the possibility of obtaining land adjoining the green for the purpose of extending the open space.

Hull T.C.—The city engineer, Mr. A. E. White, has received instructions to prepare plans for two bowling greens in the public park.

ROADS AND MATERIALS.

Abersychan U.D.C.—The surveyor, Mr. E. Whitwell, has received instructions to proceed with the proposed work at Manor-road. The council have also resolved to write to the Local Government Board for permission to proceed with other projected schemes of improvement.

Barry (Glam) U.D.C.—It has been agreed to write to the Local Government Board for a grant towards the widening of Port-road from Stumpy Hall to Weycock-road. It has also been decided to widen Palmerstown-road and to improve the roadways in the parks, level the Buttrills recreation ground, and carry out various works of private street improvements.

Bellingham R.D.C.—The diversion of East Woodburn-road is now in progress, and the surveyor, Mr. R. E. Riddle, has made a satisfactory arrangement for an exchange of land for the widening of the thoroughfare along the Fox and Hounds land.—The surveyor has been congratulated on the completion of the road at the Smale and up the Tyne, a councillor going so far as to say that if they kept going on the council would soon have the best roads in England.

Bethnal Green B.C.—The council have submitted to the Road Board a scheme of street works which could be immediately put in hand to provide employment in the borough.

East Stow R.D.C.—The surveyor, Mr. G. Harrison, has received instructions to prepare a scheme for making up Victoria-road, Stowupland.

East Suffolk C.C.—The Roads and Bridges Committee reported on Tuesday last that, as most of the granite for the main roads was imported from abroad, it was very difficult to get deliveries of stone. They therefore asked power to purchase stone from English quarries. The chief surveyor had interviewed the Road Board on the matter, and the board's surveyor strongly advised that the work on the roads should not be curtailed or delayed. The Road Board would be prepared to contribute the interest on the £15,000, which was the estimated amount required to be expended out of revenue during 1915-1916. The proposal that the council proceed in this matter was agreed to.

Flintshire C.C.—A scheme has been approved for the construction of a new road, at an estimated cost of £26,000.

Gainsborough U.D.C.—The surveyor, Mr. S. W. Parker, has received instructions to set to work wholly unemployed men three or four days a week. The relief works will include street making and an esplanade on the Trent bank.

Glamorgan C.C.—The Roads and Bridges Committee have approved the scheme of the Glyncorrwg and Margam District Councils for the construction of a road connecting the upper reaches of the Avon Valley with Port Talbot (including Tondu bridge), about 9 miles in length, 24 ft. wide, and estimated to cost

£24,000, of which £14,000 will be allotted to the Margam Council and the remainder to Glyncorrwg. The committee are asking the Road Board to make as large a grant as possible, and have promised that the county authority will take over the road when completed.

Gloucestershire C.C.—The council have authorised the Highways, Works, and General Purposes Committee to expend, in addition to the expenditure for the year 1914-15 previously estimated, such sum as they may think fit on road improvements and other public works to prevent or mitigate unemployment.

Isle of Wight R.D.C.—Negotiations have been opened up with the Road Board with a view to the adoption of a scheme for the improvement of the main road of the island at an estimated cost of £[illegible].

Linthwaite U.D.C.—The surveyor, Mr. A. Mallinson, has been instructed to prepare plans for the repair of Manchester-road.

Manchester T.C.—The city council have decided to construct a new trunk road to link up Manchester with Cheadle and Gatley in Cheshire. The Manchester road will proceed from Stockport-road, Birch Fields, Rusholme, on the eastern side of the London and North Western Railway, pass through Burnage and Cheadle, and join the main road to Winslow. The total length will be nearly 4½ miles, and the estimated cost is £171,647. The road will be 80ft. wide. Sir George Gibb, chairman of the Road Board, has offered £60,000 toward the cost of the scheme. Aldermen Wilson, Aldermen Turnbull, and the city surveyor, Mr. T. de Courcy Meade, saw Sir George Gibb on Tuesday, and got his promise of £60.

Neath R.D.C.—The surveyor, Mr. D. M. Jenkins, has submitted a list of public works which the council could put in operation, and on Monday last he received instructions to prepare plans and estimates for the proposed Dulais Valley road for submission to the county council, who are prepared to apply to the Road Board for a grant for its construction and maintenance.

Nottingham T.C.—The corporation are extending the tramway system, and are also pledged to the repaving of certain streets. Such work as this might (the *Nottingham Guardian* states) be expedited, and if there is any other work of which the same may be said, so much the better. There are several reasons why it is desirable to keep those people who cannot fight well employed at the present juncture.

Ogmore and Garw U.D.C.—It has been agreed to write to the Road Board and the county council that it was desirable that a new road should be made from Brynmenyn to Pandy, and that if the board would make a substantial grant the council would commence the work immediately. It was also decided to widen the road between Bettws Railway Station and Llangenior if unemployment made the work necessary.

Oxendon (Northants) R.D.C.—The surveyor, Mr. W. J. Smith, has received instructions to prepare road improvement schemes, which are estimated to cost £540.

Redruth U.D.C.—The surveyor, Mr. H. Monson, has been instructed to prepare an estimate for the county council of a scheme of improvement at St. Day road for which the necessary land has been presented.

St. Columb R.D.C.—The surveyor, Mr. T. T. Strongman, has submitted an estimate of the cost of carrying out stipulated works on the highway from Indian Queens to Quintrell, and it has been decided to forward a copy of the estimate to the county surveyor, as desired, a special committee being appointed to deal with any matter which might arise in connection with the road.

St. Pancras B.C.—It was stated at the council meeting recently that the borough surveyor, Mr. W. Nisbet Blair, had seen the chief engineer to the Road Board, and that the latter official had asked for particulars of works upon which displaced labour could most usefully be employed. When the full amount authorised for highway maintenance for the year had been expended the Road Board would pay over the extra sum requisite.

Swansea R.D.C.—Plans have been completed for a new road between Dunvant and Gowerton.

Tilbury U.D.C.—The council have submitted to the Essex County Council and the Road Board the following schemes as suitable for adoption immediately—viz., road paving Dockwood, at an estimated cost of £4,749; widening Sandy-lane; and widening and improving the main road from Brentwood to Gravesend, at an estimated cost of £16,543.

Tottenham U.D.C.—It is proposed to repave the carriageway at Green lanes, at an estimated cost of £15,157.

SEWERAGE AND SEWAGE DISPOSAL.

Burryport U.D.C.—A scheme of drainage, including the erection of a pumping station, has been approved. The cost is estimated at £12,000.

Dewsbury T.C.—Owing to the tenders for the construction of the sewage disposal works being considered too high, the engineer, Mr. J. Diggle, has suggested that the corporation should do the work with direct labour, and the General Purposes Committee recommend the adoption of this course. The total estimated cost of the scheme is £[illegible].

Doncaster R.D.C.—The council have approved a scheme of sewerage which is estimated to cost £5,000.

Guiseley U.D.C.—The Local Government Board have sanctioned the borrowing of £3,700 for extensions of the council's sewage works and for surface-water drainage. The council's engineer is Mr. J. N. Nicholson, ASSOC.M.INST.C.E., Bradford.

Long Eaton U.D.C.—The improvement of the main sewers and the construction of a new filter-bed are to be carried out at an estimated cost of £1,300.

Ossett T.C.—The council are advised by the sanitary inspector, Mr. C. Firth, to undertake the work of scavenging as a municipal responsibility.

Tilbury U.D.C.—An extensive scheme of surface-water drainage is under consideration, and a site for sewage disposal works has been purchased at an estimated cost of £800.

Woodhall Spa U.D.C.—The plan has been approved for the construction of a new road from Horncastle-road to Tor o' Moor-road.

WATER, GAS, AND ELECTRICITY.

Sleaford R.D.C.—The Local Government Board have declined to sanction a loan for the Anwick water supply scheme unless a pumping plant is provided; and with respect to the Enderby combined scheme, they consider that the design of the proposed water tower is not altogether satisfactory.

Rathdown No. 1 R.D.C.—An agreement has been reached with the corporation of Wicklow for a supply of water, and the engineer has received instructions to prepare estimates for the construction of mains through the district.

St. Pancras B.C.—The Electricity Committee have approved a scheme for the extension of the electric light station in King's-road.

MISCELLANEOUS.

Lanarkshire C.C.—The Middle Ward District have agreed to make arrangements for undertaking the execution of the following works at such times and in such manner as might be best calculated to meet the exceptional circumstances and conditions which might arise: (1) Camps water scheme, (2) new workmen's houses, (3) new road at Glenboig, (4) Hairmyres scheme, including forestry, (5) filling up low-lying ground at Motherwell Hospital, (6) any other works which had been provisionally agreed upon by the District Committee and the execution of which could be accelerated.

Sheffield T.C.—A special committee has been appointed to consider proposals for the re-arrangement of the city engineer's department.

Government and the New Housing Act.—The Local Government Board is urging urban and rural local authorities to take action under the new Housing Act. In a circular the board points out that, under the Housing Act, 1914, the board is authorised, with the approval of the Treasury, to make any arrangements with local authorities or authorised societies for the provision, maintenance, improvement and management of dwellings and gardens and other works or buildings for, or for the convenience of, persons belonging to the working classes, and to issue sums not exceeding £4,000,000 for the purpose of meeting capital expenditure. The Treasury will be prepared to consider advances of money to local authorities on approved schemes of building, and any advance made will be repayable in the usual periods—sixty years in respect of substantial buildings, and eighty years in respect of land purchase.

PERSONAL.

Mr. [illegible] has resigned.

Mr. J. E. Hall has been appointed [illegible] on the [illegible] Rural District Council.

Mr. J. R. [illegible] has been appointed surveyor and sanitary inspector to the Great Berkhampstead Urban District Council.

Mr. T. Groves has been promoted to the office of [illegible] works department, Negri Sembilan, Federated Malay States.

Mr. C. F. Gettings, county surveyor of Worcestershire, has appointed a [illegible] staff to render [illegible] consists of [illegible] workmen.

Mr. N. T. Gray, State engineer, Pahang, Federated Malay States, has been transferred to Perak, and Mr. [illegible] has been promoted to the position of State engineer of Pahang.

Mr. W. Redfern Kelly, M.INST.C.E., engineer-in-chief to the Bristol Harbour Commissioners, has resigned on completion of fifty years' service, and has consented to act as consulting engineer to the trust for one year.

Mr. Alfred John Jukes-Browne, F.R.S., F.G.S., the distinguished geologist, passed away recently at Torquay. He was the author of several students' handbooks on geology, and a work on "The Cretaceous Rocks of Britain."

Mr. R. Keeley, housing inspector to the Wolverhampton Corporation, has been appointed to a similar post under the Lancashire County Council, at a salary of £225 per annum. He received a farewell presentation from his colleagues at Wolverhampton.

Mr. E. Young Harrison, surveyor and water engineer to the Wellingborough Urban District Council, was on Tuesday unanimously appointed, out of seventy-three applicants, to the position of borough surveyor and water engineer of Guildford, at a salary of £350, rising to £450 per annum.

MUNICIPAL APPLIANCES IN DEMAND.

Messrs. John Yates & Co., Limited, Aston Manor, Birmingham, write: "We are pleased to inform you that so far there has been little, if any, diminution of orders from public authorities for tools; in fact, the contrary seems to be the case, as most of the county and other councils whom we regularly supply are ordering, and many other public authorities who have experienced difficulty in obtaining supplies from indirect sources, as purchasing direct from us. There will doubtless be considerable relief work done in the near future to alleviate the distress we fear we must look forward to during the forthcoming winter, and the special work will, we trust, enable us to keep our works and staff (that is, those of them who have not been called to the colours) fully employed. One interesting feature of the volume of business from new clients is that for our 'Briton' tip wagons and 'Contractor' diaphragm pumps. The cessation of supplies from the Continent has made us particularly busy in the departments manufacturing these, in addition to those parts of our works which confine themselves more particularly to the more regular requirements of our clientèle. We have complete sets of catalogues showing our manufactures as required by various professions, and can send a suitable list to any *bonâ-fide* user on request. To our regular customers we are addressing occasional letters advising them of the latest position regarding various goods we manufacture, and have made special arrangements to cope with the various difficulties arising at the present time, which we trust will be appreciated by our clients in our mutual interests."

Sheffield Hospitals Extension.—The Local Government Board have decided, without holding an inquiry, to sanction a loan of £68,000 for the extension of the Sheffield City Hospitals for Infectious Diseases at Lodge Moor. A portion of the hospital accommodation has now been set aside to meet the requirements of the military authorities.

THE MUNICIPAL AND COUNTY CLUB.

It would seem that that excellent institution the Municipal and County Club, which since its formation has had its home at Whitehall-court, is about to close its doors. It is hoped, however, that this will not be allowed to happen, and we understand that there has been put forward a scheme by which the club will come under new management. Negotiations are in progress for the acquisition of premises in the neighbourhood of the Savoy, and Mr. Charles Mason, of this journal, who is actively interesting himself in the project for carrying on the club, will be glad to hear from those who may be desirous of continuing the club, which has been so long and intimately connected with municipal affairs.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ABERYSTWYTH RURAL DISTRICT COUNCIL.

BORTH WATER SUPPLY AND SEA OUTFALL SEWER.

CONTRACT No. 3.

The Rural District Council of Aberystwyth is prepared to receive Tenders from Contractors for the construction of a covered reservoir and the laying of 6-in., 5-in., 4-in. and 3-in. Cast-iron Water Mains, together with the Valves, Hydrants and other Castings and the laying of 15-in. Cast-iron Sea Outfall.

Plans and Sections of the proposed works may be seen, and Specification, Quantities, Form of Tender, and other particulars obtained, from the Engineers on application to Messrs. Dodd & Dodd, MM.INST.C.E., County Chambers, Corporation-street, Birmingham, on and after Friday, 28th day of August, 1914, on payment of a deposit of Five Guineas, which will only be returned on receipt of a *bonâ-fide* Tender and the return of all documents.

Sealed Tenders, endorsed "Tender for Contract No. 3," are to be delivered at my Office at Aberystwyth at or before noon on Monday, the 14th day of September, 1914.

The lowest or any Tender will not necessarily be accepted.

(By order)

HUGH HUGHES,
Clerk.

8 Market-street,
Aberystwyth.
August 25, 1914. (1,881)

ABERYSTWYTH RURAL DISTRICT COUNCIL.

BORTH WATER SUPPLY AND SEA OUTFALL SEWER.

CLERK OF WORKS.

The Candidate must have had previous experience of similar works, be able to set out works, test materials, use the various surveying instruments, and measure up work done.

The person will be required to act under Messrs. Dodd & Dodd, MM.INST.C.E., the Engineers to the Council.

The salary will be at the rate of Three Guineas per week.

Applications, endorsed "Clerk of Works," stating age and qualifications, accompanied by copies of three recent testimonials, to be sent to the undersigned not later than 12 o'clock noon on the 14th day of September, 1914.

Applicants who canvass any members of the Council, either directly or indirectly, will be disqualified.

HUGH HUGHES,
Clerk.

8 Market-street,
Aberystwyth
August 25, 1914. (1,880)

WEST SUFFOLK COUNTY COUNCIL. Divisional Surveyor for Main Roads required. Salary £145 per annum, to include provision and upkeep of Motor Cycle. Applications to be sent in before 15th September. Particulars from the undersigned, W. Lionel Jenkins, County Surveyor, Shire Hall, Bury St. Edmunds. (1,882)

SEWAGE DISPOSAL AND THE PROTECTION OF WATER SUPPLIES.

[Report made to the International Joint Commission by a joint conference of U.S.A. and Canadian engineers upon the pollution of the waters of the great lakes and rivers which form the boundary between the two countries, with suggestions as to the necessary remedies.*]

(1) Speaking generally, water supplies taken from streams and lakes which receive the drainage of agricultural and grazing lands, rural communities, and unsewered towns are unsafe for use without purification, but are safe for use if purified.

(2) Water supplies taken from streams and lakes into which the sewage of cities and towns is directly discharged are safe for use after purification provided the load upon the purifying mechanism is not too great, and that a sufficient factor of safety is maintained; and, further, provided the plant is properly operated.

(3) As, in general, the boundary waters in their natural state are relatively clear and contain but little organic matter, the best index of pollution now available for the purpose of ascertaining whether a water-purification plant is overloaded is the number of B. coli per 100 c.c. of water expressed as an annual average and determined from a considerable number of confirmatory tests regularly made throughout the year.

SAFE LOADING OF PURIFICATION PLANT.

(4) While present information does not permit a definite limit of safe loading of a water-purification plant to be established, it is our judgment that this limit is exceeded if the annual average number of B. coli in the water delivered to the plant is higher than about 500 per 100 c.c., or if in 0·1 c.c. samples of the water B. coli is found 50 per cent of the time. With such a limit the number of B. coli would be less than the figure given during a part of the year, and would be exceeded during some periods.

(5) In waterways where some pollution is inevitable, and where the ratio of the volume of water to the volume of sewage is so large that no local nuisance can result, it is our judgment that the method of sewage disposal by dilution represents a natural resource, and that the utilisation of this resource is justifiable for economic reasons, provided that an unreasonable burden or responsibility is not placed upon any water-purification plant, and that no menace to the public health is occasioned thereby.

(6) While realising that in certain cases the discharge of crude sewage into the boundary waters may be without danger, it is our judgment that effective sanitary administration requires the adoption of the general policy that no untreated sewage from cities or towns shall be discharged into the boundary waters.

TREATMENT TO SUIT LOCAL CONDITIONS.

(7) The nature of the sewage treatment required should vary according to the local conditions, each community being permitted to take advantage of its situation with respect to local conditions and its remoteness from other communities, with the intent that the cost of sewage treatment may be kept reasonably low.

(8) In general, the simplest allowable method of sewage treatment, such as would be suitable for small communities remote from other communities, should be the removal of the larger suspended solids by screening through a ¼-in. mesh or by sedimentation.

(9) In general, no more elaborate method of sewage treatment should be required than the removal of the suspended solids by fine screening or by sedimentation, or both, followed by chemical disinfection or sterilisation of the clarified sewage. Except in the case of some of the smaller streams on the boundary, it is our judgment that such oxidising processes as intermittent sand filtration and treatment by sprinkling filters, contact beds, and the like, are unnecessary, inasmuch as ample dilution in the lakes and large streams will provide sufficient oxygen for the ultimate destruction of the organic matter.

(10) Disinfection or sterilisation of the sewage of a community should be required wherever there is danger of the boundary waters being so polluted that the load on any water-purification plant becomes greater than the limit above mentioned.

(11) It is our opinion that, in general, protection of water supplies is more economically secured by water purification at the intake than by sewage purification at the sewer outlet, but that under some conditions both water purification and sewage treatment may be necessary.

BACTERIOLOGICAL TESTS.

(12) The bacteriological tests which have been made in large numbers under the direction of the International Joint Commission indicate that in some places the pollution of the boundary waters is such as to be a general menace to the public health should the water be used without purification as sources of public water supply or should they be used for drinking purposes by persons travelling in boats.

(13) It is our judgment that the drinking water used on vessels traversing boundary waters should not be taken indiscriminately from the waters traversed, unless subjected to adequate purification; but should be obtained preferably from safe sources of supply at the terminals.

(14) While recognising that the direct discharge of fæcal matter from boats into the boundary waters may often be without danger; yet, in the interest of effective sanitary administration, it is our judgment that the indiscriminate discharge of unsterilised fæcal matter from vessels into the boundary waters should not be permitted.

* Extract from *Engineering Record*.

BUSINESS AS USUAL.

THE TIME TO ADVERTISE.

A large gathering of advertisers and traders met on Tuesday at the Cannon-street Hotel, London, to discuss the commercial position in relation to the war, and unanimously passed a resolution urging the Press not to relax its efforts to restore the confidence of the public in the stability of trade.

Advocating a campaign of advertising, Mr. Gordon Selfridge said it was the duty of traders, instead of withdrawing their forces of publicity, to make those forces stronger still. Publicity was the material which raised the steam and kept the business of the nation going.

Mr. T. Russell, president of the Incorporated Society of Advertising Consultants, pointed out that there would be a rich reward for traders after the war, and the time to make their goods known was now, and through the columns of the British Press.

A second resolution was passed calling upon manufacturers of branded goods to keep the merit of their productions before the public. "If," said the mover, "a manufacturer stopped publicity the public soon forgot him."

Messrs. D. G. Somerville & Co., Limited, 120 Victoria-street, S.W., ask us to state that they are carrying on their various engineering and contracting departments without interruption at the present time. They have large stocks of iron, steel, and timber, and are experiencing no difficulty in obtaining supplies of all materials.

Waterproofing Materials. Owing to the war there will doubtless be many architects and contractors who, having specified foreign-made materials, will find it difficult, if not impossible, to get such goods. Even if they do get them, there will doubtless be a feeling against supporting the enemy's trade—when the make is Austrian or German. We are asked by the proprietors of Pudlo—the powder which makes cement waterproof—to state that this material is British throughout; every one of its ingredients is British, no imported materials being used in its manufacture. The works are still running as in normal times, and the makers have an emergency stock of many tons, so that there will be no delay in the execution of orders. There will therefore be no necessity for any work to cease because of the difficulty of obtaining foreign supplies specified prior to the war, and it is suggested that those who have previously specified foreign materials should substitute British articles. Messrs. Kerner-Greenwood & Co. also point to the advantages of waterproofed cement as a substitute for Continental asphalts in building work, in view of the difficulty of obtaining foreign materials at the present time.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. Pickering, M.Inst.C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. Dudley Robinson, B.Sc.(Lond.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CLERK OF WORKS.—August 29th.—Corporation of Walsall. £4 per week.—Mr. H. Lee, town clerk.

SURVEYOR'S ASSISTANT.—August 29th. Uxbridge Rural District Council. £2 per week.—Mr. C. Woodbridge, clerk, 38 High-street, Uxbridge.

ASSISTANT INSPECTOR OF NUISANCES. August 31st. Corporation of Warrington. £78—£125 per annum.—Mr. G. W. N. Joseph, medical officer of health, 78 Sankey-street.

CLERK OF WORKS.—August 31st.—Earby Urban District Council.—Mr. J. E. Aldersley, engineer.

ASSISTANT SANITARY INSPECTOR.—September 2nd.—Nuneaton Town Council. £100—£120 per annum. —Mr. V. Gray Maitland, medical officer of health.

SURVEYOR'S ASSISTANT.—September 2nd.—Corporation of Mansfield. £80—£100 per annum. Mr. H. E. Davies, town clerk.

HIGHWAY SURVEYOR (Working).—September 2nd.—Bucklow (Cheshire) Rural District Council. £175—£200 per annum.—Mr. George Leigh, clerk, Union Offices, Knutsford.

INSPECTOR OF NUISANCES, SANITARY SURVEYOR, AND SURVEYOR OF HIGHWAYS.—September 5th.—Uttoxeter Urban District Council. £140 per annum.—Mr. Frank F. Hawthorn, clerk, Council Offices, Uttoxeter.

ASSISTANT TO COUNTY SURVEYOR.—September 7th.—Pembrokeshire County Council. £150 per annum.—Mr. Arthur H. Thomas, county surveyor, Haverfordwest.

SURVEYOR.—September 7th.—Okehampton Town Council. £85—£100 per annum.—Mr. J. J. Newcombe, town clerk.

CLERK OF WORKS.—September 7th.—Bedwellty Urban District Council. £3 per week.—Mr. T. J. Thomas, clerk, 36 High-street, Bargoed.

TEMPORARY ARCHITECTURAL ASSISTANT.—September 10th.—Morley Town Council.—Mr. Fred Thackray, town clerk.

ASSISTANT SURVEYOR.—September 12th.—Swansea Rural District Council. £120 per annum.—Mr. E. Harris, clerk, Alexandra-road, Swansea.

ASSISTANT SURVEYOR.—September 12th. Devon County Council. £150—£200. Mr. R. M. Stone, county surveyor (No. 4 Division), The Square, Barnstaple.

BOROUGH SURVEYOR.—September 15th. Corporation of Swansea. £500 per annum. Mr. W. Lang Couch, town clerk, guildhall, Swansea.

CHIEF DRAUGHTSMAN.—September 30th. City of Westminster. £200—£250 per annum. Mr. John Hunt, town clerk, City Hall, Charing Cross-road, W.C.

ARCHITECTURAL AND SURVEYING ASSISTANT.—Middlesex County Council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

ASSISTANT ENGINEER.—Nyassaland Public Works Department. £200—£300. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

BOROUGH ENGINEER AND SURVEYOR.—Corporation of Salford. £900—£1,100.—Mr. L. C. Evans, town clerk, Town Hall, Salford.

ENGINEERING AND SURVEYING ASSISTANTS (4).—Middlesex County Council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

FOREMAN OF WORKS.—Nigeria. £250—£300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

INSPECTOR OF WATERWORKS.—Federated Malay States. £180—£280.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter*

GATESHEAD.—September 10th.—Designs for a school for 700 scholars, for the Education Committee. —The Clerk.

GLASGOW.—September 18th.—Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ESSEX.—August 31st.—For the erection of a handicraft centre, for the Education Committee.—Mr. G. Topham Forrest, county architect, 73 Duke-street, Chelmsford.

ESSEX.—August 31st.—For the erection of a new bridge over the river Blackwater, in the parish of Langford, in ferro-concrete (on the Hennebique system), for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

LEICESTER.—September 1st.—For the erection of classrooms and additions, for the corporation.—Borough Engineer.

CANNOCK.—September 1st.—For the erection of a school, for the urban district council.—Messrs. Bailey & Solon, architects, Bridge-street, Walsall.

THURNSCOE.—September 1st.—For the erection of a public convenience, for the urban district council. —Mr. T. Bull, surveyor.

STANLEY.—September 1st.—For the erection of an underground convenience and storehouse, for the urban district council.—The Surveyor.

SEDBERGH.—September 1st.—For building three cottages, for the rural district council.—Mr. J. Stalker, architect, 57 Highgate, Kendal.

BRADFORD.—September 1st.—For the erection of forty-five workmen's dwellings, for the corporation City Architect, Town Hall.

KEIGHLEY.—September 2nd.—For the erection of boundary walls, shelter, and railings, for the corporation.—Borough Engineer.

LLANDUDNO.—September 3rd.—For the erection of twenty-four workmen's dwellings, for the urban district council.—Mr. W. T. Ward, deputy engineer and surveyor.

NORTH RIDING.—September 4th.—For the erection of a school, for the Education Committee.—Mr. J. C. Wrigley, secretary, Education Offices, Northallerton.

RUISLIP NORTHWOOD.—September 5th.—For the erection of a bridge and lavatories, and reconstructing a rifle range, for the urban district council.—The Surveyor, Council Offices, Northwood.

SHEERNESS.—September 7th.—For the demolition of engine-house and the construction of a new building and other works, for the urban district council.—Mr. F. W. S. Stanton, engineer, 3 Victoria-street, Westminster, S.W.

WEST RIDING.—September 7th.—For widening a bridge, for the county council.—Mr. F. G. Carpenter, West Riding surveyor, County Hall, Wakefield.

GLASGOW.—September 8th.—For the erection of a shelter and convenience, for the corporation.—Messrs. F. Burnet & Boston, 180 Hope-street, Glasgow.

HAMPTON.—September 8th.—For the erection of a police cottage, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

ILFORD.—September 8th.—For the erection of workshops at the electricity works, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

ILFORD.—September 8th.—For the erection of refuse destructor buildings, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

FARNWORTH.—September 12th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

EVESHAM.—September 12th.—For the erection of forty-six cottages, for the rural district council.—The Clerk.

HALIFAX.—September 14th.—For the erection of a store shed and alterations to existing buildings, for the corporation.—Mr. J. Lord, borough engineer.

BRADFORD.—September 16th.—For the erection of eight workmen's dwellings, for the corporation.—Mr. F. Stevens, town clerk.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

EDINBURGH.—September 8th.—For the supply of 400 tons of 9-in. dry sand cast-iron pipes, for the Water Trustees.—Messrs. J. & A. Leslie & Reid, 12 St. Giles-street, Edinburgh.

MANCHESTER.—September 15th.—For the supply and erection of steel storage shelving, for the Tramways Committee.—Mr. J. M. McElroy, general manager, corporation tramways, 55 Piccadilly, Manchester.

KEIGHLEY.—September 5th.—For the supply of cylinders for reservoir works, for the corporation.—Mr. M. R. Barrett, engineer, Town Hall.

Roads.

BIRSTALL.—August 31st.—For making up a certain street, for the urban district council.—Mr. T. H. Hailstone, surveyor.

CARMARTHEN.—August 31st.—For widening and improving a main road, for the county council.—Mr. G. Henry, county surveyor, Shire Hall, Llandilo.

DOVER.—August 31st—September 1st.—For the supply of Cherbourg quartzite and Guernsey granite, Guernsey chippings, and Guernsey siftings, for the corporation.—Mr. R. E. Knocker, town clerk.

DUNDEE.—August 31st.—For repaving part of Ann-street, for the corporation.—Mr. J. Thomson, city engineer, 91 Commercial-street.

GILDERSOME.—August 31st.—For rolling and scarifying for twelve months, for the urban district council.—Mr. W. Wilby, surveyor.

HARROGATE.—August 31st.—For private street works, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

HAVERFORDWEST.—August 31st.—For kerbing, channelling and paving works, for the corporation.—Mr. W. Bevan, borough surveyor.

PLYMOUTH.—August 31st.—For making up certain streets, for the corporation.—Mr. J. Paton, borough engineer.

SOUTH MIMMS.—September 1st.—For the supply of Leicestershire or other granite, chippings, double-screened hoggin, single-screened hoggin, and 6,000 gallons of distilled tar, for the rural district council.—Mr. G. Simcox, surveyor, "Bearwood," Great North-road, Potter's Bar.

WALLASEY.—September 1st.—For the supply of a 12-ton compound steam roller, for the corporation.—Borough Engineer and Surveyor, 18 Falkland-road, Egremont, Wallasey.

EASINGTON.—September 1st.—For making up and paving certain private streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

LEATHERHEAD.—September 1st.—For the supply of about 300 tons of tar-macadam of hard blast furnace slag of various sizes, for the urban district council.—Mr. Sidney R. Drake, surveyor.

THURNSCOE.—September 1st.—For making up seven streets, for the urban district council.—Mr. T. Bull, surveyor.

GLAMORGAN.—September 2nd.—For the execution of road work, for the county council.—County Hall, Cardiff.

MONMOUTH.—September 2nd.—For improving and widening Llanarth-road, for the county council.—Mr. W. Tanner, county surveyor, Newport, Mon.

HOVE.—September 2nd.—For work in connection with the widening of Hove-street, for the corporation.—Mr. H. H. Scott, borough surveyor.

RAMSBOTTOM.—September 3rd.—For the supply of road and other materials, for the urban district council.—Mr. T. H. Bell, surveyor.

LUTON.—September 3rd.—For the execution of street works, for the corporation.—Borough Engineer.

FRIERN BARNET.—September 3rd.—For kerbing, channelling and making up Alexandra-road (part of), and the eastern portion of Athenæum-road, Whetstone, N., for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor, Council Offices, The Priory, Friern Barnet, N.

RUISLIP-NORTHWOOD.—September 5th.—For making up a private street.—The Surveyor, Northwood.

STAINES.—September 5th.—For road works in connection with the construction of the Metropolitan Water Board reservoirs, for the rural district council.—Mr. G. W. Manning, surveyor, London-road, Ashford, Middlesex.

WALSALL.—September 5th.—For making a road, for the Walsall and Bromwich Joint Committee.—Mr. A. H. Ward, clerk, 22 Lombard-street, West Bromwich.

BRAINTREE.—September 5th.—For the supply of 700 tons of granite, for the rural district council.—Mr. C. V. Bright, London-road, Braintree.

HUYTON.—September 5th.—For the supply of 400 tons of macadam, for the urban district council.—Mr. G. W. Swift, clerk.

MANCHESTER.—September 5th.—For the supply of Portland cement, river sand, gravel and broken stone, for the Rivers Committee.—Mr. Oswald J. Wilkinson, 196 Deansgate, Manchester.

LLANDUDNO.—September 7th.—For work of road construction, for the Joint Committee.—Mr. W. T. Ward, engineer, Town Hall, Llandudno.

SUNBURY.—September 7th.—For the reconstruction of two roads, for the urban district council.—Mr. H. F. Coales, engineer, Council Offices, Sunbury-on-Thames.

SOUTHAMPTON.—September 7th.—For the execution of private street works, for the corporation.—Borough Engineer.

ITCHEN.—September 7th.—For executing works in certain roads, for the urban district council.—Mr. T. A. Collingwood, surveyor.

[illegible]GRAVE.—September 7th.—For the supply of [illegible] for the corporation.—Mr. F. T. Cooper, [illegible] Surveyor.

ILFORD.—September 7th.—For making up certain [illegible] for the urban district council.—Mr. H. Shaw, [illegible] Surveyor.

LEEDS.—September 7th.—For laying tramway track [illegible] for the corporation.—Mr. J. B. Hamilton, [illegible] of Tramways, Town Hall.

BRIGHTON.—September 8th.—For the supply of dressed kerb and channel, for the corporation.—Borough Surveyor.

HORNSEY.—September 8th.—For grading and tarpaving [illegible] for the urban district council.—Engineer and Surveyor, Town Hall, Highgate, N.

CLUTTON.—September 8th.—For steam rolling and scarifying, for the rural district council.—Mr. J. S. Drury, clerk, Temple Cloud, Bristol.

WILLESDEN.—September 8th.—For the supply of [illegible] for the urban district council.—Mr. O. Claude Robson, engineer, Municipal Offices, Dyne-road, Kilburn, N.W.

TANGIER.—October 3rd.—For road construction, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

Sanitary.

SOWERBY.—August 31st.—For the construction of main sewers, for the urban district council.—Messrs. Utley, Hebblethwaite & Utley, 10 Waterhouse-street, Halifax.

ASHTON-UNDER-LYNE.—August 31st.—For one sewage sludge press of large capacity, and one 10-in., and one 6-in. diameter centrifugal pump for pumping sewage, with all suction and delivery pipes, for the corporation.—Mr. J. Rowbottom, engineer, Town Hall.

CHERTSEY.—August 31st.—For laying stoneware [illegible] concrete tubes, and manholes, for the rural district council.—Mr. H. E. Paine, clerk.

SHREWSBURY.—September 1st.—For laying 530 lin. yds. of 12-in. pipe sewer and manholes, for the corporation.—Mr. A. W. Ward, borough surveyor.

TOTTINGTON (Lancs).—September 1st.—For the provision and laying of about 8,060 lin. yds. of cast-iron and stoneware pipe sewers, manholes, and storm-water chambers; also alterations to screening chamber, and tanks, and the construction of sedimentation tanks, percolating filters, humus tanks, sludge beds, channels, and diversion of stream course, for the urban district council.—Mr. L. Kenyon, engineer, Council Offices.

KIRKBY-IN-ASHFIELD.—September 1st.—For the execution of works of sewerage, for the urban district council.—Mr. W. Dodsley, surveyor.

SWANSEA.—September 1st.—For the construction of pipe sewers and surface-water drains, for the corporation.—Borough Engineer.

PLYMOUTH.—September 2nd.—For the reconstruction of a drain, for the corporation.—Mr. J. Paton, borough engineer and surveyor.

HEXHAM.—September 5th.—For the execution of a scheme of main drainage and sewage disposal, for the rural district council.—Messrs. D. Balfour & Son, 3 St. Nicholas-buildings, Newcastle-on-Tyne.

ST. ALBANS.—September 5th.—For works of sewerage, consisting of pipe sewers, manholes, flushing apparatus, gullies, and connections, for the corporation.—Mr. H. Humphreys, engineer, 28 Victoria-street, Westminster, London, S.W.

MOTTRAM.—September 5th.—For cleansing and emptying closets and ashpits, for the urban district council.—Mr. S. Hudson, inspector.

WILLINGTON.—September 5th.—For the construction of sludge beds and drainage, for the urban district council.—Mr. J. H. Gardner, surveyor.

ITCHEN.—September 7th.—For work of surface-water drainage, for the urban district council.—Mr. T. A. Collingwood, surveyor, Woolston.

FARINGDON.—September 8th.—For supplying and laying about 700 yds. of 9-in. glazed stoneware socket sewer at Longworth, for the rural district council.—Mr. H. Glynn Warne, engineer, Faringdon, Berks.

EPSOM.—September 8th.—For scavenging work, for the rural district council.—Mr. W. T. Wooldridge, surveyor.

BEAYDON.—September 8th.—For the removal and disposal of the contents of ashpits, for the urban district council.—Mr. R. Bagnall, Council Office.

SHIPLEY.—September 8th.—For construction work at the sewage disposal works, for the urban district council.—Messrs. W. Paterson & J. M. Nicholson, 19 [illegible] Chambers, Bradford.

RHYMNEY VALLEY.—September 9th.—For the construction of main outfall sewer, about 10 miles long, for the Sewerage Board.—Messrs. Wilcox & Raikes, 9 Victoria-street, Westminster, and Mr. T. J. Thomas, 36 High-street, Bargoed, Glam.

CHEADLE.—September 10th.—For the enlargement of the sewage disposal works, for the rural district council.—Mr. F. T. Inskip, surveyor.

COCKERMOUTH.—September 12th.—For laying 2,000 yds. of sewers and constructing manholes and flushing chambers, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

BRADFORD.—August 31st.—For the supply of gas meters, pipes, castings, wrought-iron steam tubing, iron, steel, charging shovels, oxide wiskets, weed brooms, cotton waste, engine oil, cylinder oil, brass main gas cocks, lime, copper lamps, iron lamps, and sheet glass and opal glass for street lamps, for the corporation.—Mr. F. Stevens, town clerk.

ROCHESTER.—September 1st.—For the supply of tools, horse hire, forage, Portland cement, brooms, oils, paving materials, road metal, and coal, for the corporation.—Mr. William Banks, city surveyor.

Miscellaneous.

SOUTHEND.—September 2nd.—For the supply of coal for a period of one year from October 1, 1914, for the corporation.—Mr. Ernest J. Elford, borough surveyor, Municipal Buildings, Southend-on-Sea.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BARNSLEY.—Accepted for making up two streets, for the corporation.—Mr. J. Henry Taylor, borough surveyor:—

J. Hood, Barnsley.—William-street, £252; Milton-street, £164.

ERITH.—For the erection of a school, for the urban district council.—Mr. H. Hind, surveyor:—

J. W. Ellingham, Dartford	£9,169
L. Kazak, Belvedere	9,169
Friday & Ling, Erith	8,974
G. H. Gunning & Sons, Erith *	8,749

PORTSLADE.—For the construction of main surface-water sewer and outfall works, for the urban district council.—Messrs. Chatterton & Alford, Westminster, S.W.:—

Pilgrim & Son, Limited, Whetstone	£3,660
F. E. Binns & Co., Croydon	3,591
Peerless, Dennis & Co., Limited, Eastbourne	3,467
T. Wilkinson & Co., Poole, Dorset	3,406
E. Iles, senr., Croydon	3,380
D. T. Jackson, Barking, Essex	3,180
H. Farrow, Brixton	3,157
S. Carey, Bexhill-on-Sea	3,034
McKellar & Westerman, Hove	2,769
J. Parsons & Sons, Hove *	2,652

WANSTEAD.—For the Aldersbrook-road improvement, for the urban district council.—Mr. C. H. Bressey, surveyor:—

WIDENING.

W. Jackson, Forest Gate, E.	£1,300
— Blaker, Leatherhead	1,274
T. Adams, Wood Green, N.	1,258
W. & C. French, Buckhurst Hill *	1,165
G. J. Anderson, Poplar, E.	1,151

RESURFACING.

		Per sq. yd. s.	d.
Limmer Asphalte Company, Westminster, S.W.	£4,010	8	6
Highways Construction Company, Finsbury-pavement, E.C.	3,459	7	4
H. V. Smith & Co., Westminster, S.W.	3,420	7	3
Roadamant Company, Limited, London-wall, E.C.	2,712	5	9
Tarmac, Limited, Westminster, S.W.*	2,712	5	9
— Blaker, Leatherhead	2,594	5	6
Premier Bitumen Company, Limited, Stratford, E.	Material only	3	9
W. Shepherd, Rochdale	—	7	6

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. SEPTEMBER 4, 1914. No. 1,181.

Minutes of Proceedings.

Town Planning in Practice.

The length of time necessarily occupied in the preparation of a town planning scheme of any magnitude, to say nothing of its execution, coupled with the fact that the Act authorising such schemes was only passed some five years ago, has placed an inevitable limit to the lessons which can as yet be learnt in the valuable school of practical experience. Hitherto there has been a tendency in many quarters to regard a town-planning scheme entirely from the point of view of the benefits to be derived from it, and apart from any adequate consideration of the question of cost. But, as was well said by Mr. F. W. Pearce, the surveyor to the Twickenham Urban District Council, in the paper which he read at the Cheltenham conference of the Institution of Municipal and County Engineers, the Town Planning Act is not, nor was it intended to be, a means of getting something for nothing. The title of Mr. Pearce's paper was "Town Planning Problems in Partially Developed Areas"—a subject with which he is peculiarly qualified to deal, as he is comparatively fresh from the actual preparation of a scheme of this character. The paper raised several very important practical points, the first of which in logical order was as to the circumstances under which it is desirable to take steps to obtain the sanction of the Local Government Board to the preparation of a scheme. In this connection it may be said at once that the great public advantages which flow from the increased control over development in an area which is the subject of a town-planning scheme render it generally desirable to undertake a scheme without delay in districts which are actually in course of development. In considering what lands are to be included, two points of difficulty ordinarily arise—namely, in regard to the inclusion of lands in an adjoining district, and of lands already built upon or not likely to be used for building purposes. The first of these matters affords scope for neighbouring authorities to set an example to landowners in regard to co-operation. For the inclusion of the second class of lands, the consent of the Local Government Board must be obtained, and it is for the local authority to show the necessity for their inclusion.

In regard to the provision of roads as part of a scheme, Mr. Pearce pointed to the necessity for consultation between neighbouring authorities as to arterial roads. The question of estate roads, however, is still in the realm of debate. The attempt to include in a scheme a detailed development plan, showing the lay-out of streets and the position of buildings, involves considerable trouble and difficulty and not a little delay, and it is at least open to question whether the benefit derived from this procedure is such as to render it worth while. Among other matters dealt with by Mr. Pearce was that of the burden of the cost of road construction. The general principle which he laid down was that "those who benefit should bear the cost." Few will be found to quarrel with this maxim, embodying as it does an old principle of English highway law, exemplified in the legislation dealing with the execution of private street works. It is one, moreover, for which we have long contended, urging that with the advent of through motor traffic the day of the responsibility of the parish for the maintenance of highways, and of the county for the upkeep of main roads, is past. Equally absurd would be the responsibility of the frontagers for the first cost of modern arterial roads, which benefit the whole community. In regard, then, both to construction and maintenance, we agree with the principle laid down by Mr. Pearce. The chief difficulty arises, however, in devising an equitable scheme for putting the principle into practice—a matter as to which we must reserve what we have to say to some future occasion.

* * *

The Meaning of "Engineer."

"The Connotation of the Term 'Engineer'" was the title of a somewhat novel paper read a short time ago by Mr. W. F. Tyler, ASSOC INST.C.E., before the Engineering Society of China, and, having regard to the looseness with which that word is frequently used, we are glad to avail ourselves of the opportunity presented by the occasion to offer a few observations on the subject. We are all familiar with the difficulty which occurs in defining any simple object of finding a form of words which will apply to the given object, *and to nothing else*. Similarly in determining what objects or persons can logically be called by a single name such as engineer it must be borne in mind that the members of the class determined upon must possess some common attribute, and that the class must include *all* individuals possessing that attribute. Mr. Tyler points out that the existing connotation of the term "engineer" forms a notable example of a departure from this principle, and he very pertinently asks what are the common attributes possessed by the civil engineer, the mechanical engineer, or the electrical engineer which are not also possessed by the constructive architect and by the ship builder? Some of our readers may be tempted to ask whether any real importance attaches to this looseness of expression, having regard to the fact that almost every person who describes himself as an "engineer" adds by way of prefix some qualifying word, such as "civil," "mechanical," "sanitary," or "municipal," to indicate more definitely the exact type of work in which he professes special skill. To this we unhesitatingly reply that the matter is important for the reasons given by Mr. Tyler. In the first place, a belief is created in the lay mind that there is a greater affinity between the spheres of the several kinds of "engineer" than really exists; and in the second place this belief leads to undue demands

being made in the knowledge of an engineer specialised in a certain branch of work, with perhaps the qualifying tendency to be under-claim by the engineer in the same direction.

There is probably no class of engineers which suffers more in this way than that of municipal engineers. The energy of the elements made upon their skill and energy has become proverbial. To the individual councillor they are "engineers," and too often are expected to deal in an equally expert manner with matters of sanitation, highway engineering, mechanical, and even electrical work. A consideration of this fact raises the large question of the relationship between the municipal engineer and the expert consultant; but we cannot discuss that matter here. Before leaving Mr. Tyler's paper, however, we should like to quote what he had to say about the history of the word "engineer."

It might have been imagined that in the Middle Ages Satan had a sufficient reputation to need no additional superlative, so it is a very quaint touch to dub him in addition "a great engineer." There are in the English language to-day many such figurative curiosities. For instance, a man may take a great pride in a scheme which he has evolved, but would bitterly resent being called a "schemer." But now comes a more gratifying consideration. The general tendency is for words morally to degenerate in meaning. In the case of the word "engineer," however, we find that the meaning has during the latter half of its career evolved in the opposite direction, until it has now been said to have, in respect to civil engineers, no less a meaning than "the profession which has for its aim the lessening of human evil and the increasing of human comfort for the advantage of the whole world." There could be no greater example of the moral improvement in the general use of a word than this; and no greater tribute to the profession can be found than this some fact, which we can say is the result of the influence of the lives of its exponents.

Professor Blanchard on Bituminous Pavements.

A very useful summary of leading methods of producing bituminous films and bituminous layers of road-crusts is provided in a paper by Prof. A. Blanchard, read at Montreal last May, and reproduced in another part of this issue. In this paper, and in accordance with American practice, the term "bituminous macadam" is applied to grouted crusts, and "bituminous concrete" to crust made by mixing methods. The four definitions are quite clear, except that in the fourth the word "layer" should have been employed instead of "surface." This is a glaring inconsistency, since the words "surface" and "surfacing" are much used in this country to designate layers and even whole crust thicknesses. So far has this abuse of the word "surface" been carried, that it will now be necessary to find another word to designate a surface, and we shall probably have to use the term "superficies." The use of the word "surfacing" for a thin film need not be objected to, since it means "that which is applied to the surface," but it would be better to use the words "smear" and "smearing."

It is interesting to note that Prof. Blanchard considers that Mr. Brodie's method of making a crust with a bituminous-bound upper course provides "the most satisfactory type of bituminous macadam pavement at present constructed in England." In view of the fact that the word "pitchmac" only applies to the wearing layer, unless the word "pitch" is used in both senses, it is worth pointing out that the success of Mr. Brodie's road-crusts is, no doubt, largely due to the fact that the use of adequate thickness, a 4-in. course of bituminous-bound material on a 10-in. lower course of hand-pitched stone, provides a really effective spreading of wheel loads on the subsoil. A type of "bituminous concrete" pavement referred to by Prof. Blanchard as one of the most successful consists mainly of stuff passing a ½-in. screen, 34·7 per cent. a ¼-in. screen, 40·6 per cent, and a 1-in. screen, 17·3 per cent., and Prof. Blanchard believes that an essential element of success in a crust of this type consists in using a crusher product with a "range from 1 in. to 1¼ in. in its sizes." Since only 2 per cent of the metal referred to consisted of stone passing a 1¼-in. screen, and 17·3 per cent that passing a 1-in. screen, his meaning seems to be that the aggregate must contain some considerable proportion of stone of the sizes referred to, but not necessarily a large proportion. Another noteworthy type of pavement described in Prof. Blanchard's paper is made in three courses—the bottom course having a range of sizes 1¼ to 2½, the next layer a range ½ to 1¼, and the top layer ¼ to ½, the pavement being finished with uncoated chips. One would have supposed that in such a road-crust greater stability would be secured by the incorporation of some smaller packing material in the bottom course to prevent the shifting or rocking of the larger stones. As regards Mr Prevost Hubbard's specifications, quoted in the paper, the clause which most deserves the attention of British highway engineers is that in which the load per linear inch of the roller is specified. This clause is not quite satisfactory, since the proper load per linear inch depends upon the diameter of the roller, but it is an important advance on those specifications for rolling which give only the whole weight of the machine.

Work not Charity.

One of the principles laid down by the Cabinet Committee on Distress is that, as far as possible, the relief to be given through the various local committees should take the form of the provision of employment rather than the multiplication of direct gifts. We imagine that, while recognising that there will inevitably be many cases in which relief can only be given in the latter way, most thoughtful persons will be in agreement on this point. The question then arises as to the nature of the public works which can reasonably be undertaken in the peculiar conditions which will obtain. In the first place, it is evident that works of a special kind requiring for their execution a comparatively large proportion of highly skilled labour are unsuitable. The labour to be employed must necessarily be unskilled, most of the men not possessing even the ordinary skill of the labourer with pick and shovel or hod. Nevertheless, it is highly desirable that their labour should be turned in a direction which, if possible, may not only be immediately useful, but even of lasting public benefit. In this connection a letter from Mr. Thomas H. Mawson, which appeared in a recent issue of the *Manchester Guardian*, is deserving of the widest publicity. His suggestion, put shortly, is that this mass of labour should be turned to the laying out of public parks and gardens in and around those large centres of population where distress is certain to be most acute. If land can be obtained, either as a gift or at a reasonable price, the work thus created would go far to relieve distress, not only without pauperisation, but with direct physical benefit to many of the workers by the exchange for the time being of indoor work for the healthy exercise which the use of the spade provides. Mr. Mawson, who is specially qualified to speak with authority on this subject, points out that twenty years ago, during the distress which then prevailed owing to the slackness of trade, a great deal of this sort of work was done up and down the country with the most beneficial results. We cordially

endorse the opinion embodied in his letter and commend the idea to those authorities who are about to undertake relief works.

* * *

Salford Council and the Borough Engineership.

In the discussions that have taken place at the Salford Town Council with respect to the scope of the borough engineer's duties it was manifest that there was considerable difference of opinion on the question whether the new official should be in fact as well as in name borough engineer and surveyor. The matter was eventually considered by the Finance Committee according to the terms of reference from the council instructing them to amend a prior report "in the direction of strengthening the borough engineer's position by being made, as far as practicable, the authority through whom the various committees shall exercise their functions appropriate for his supervision." The report upon this reference submitted to the town council by the Finance Committee conferred upon the borough engineer plenary powers, so to speak, with respect to street constructional works, with the proviso, however, that "if required" the officer was authorised to supervise works of construction, reconstruction, or repair. This terminology failed to satisfy the council, which not only, by an overwhelming majority of thirty votes to three, insisted upon the deletion of the words "if required" in the clause dealing with streets, but also struck them out wherever they appeared elsewhere in the report of the Finance Committee. It appears therefore that the town council had finally determined that there should be no doubt or qualification with respect to the nature of the official responsibility to be cast upon the proposed new official, and the town clerk, upon being appealed to at the termination of the proceedings to define the position, gave it as his opinion that the powers of supervision given to the borough engineer "meant actually seeing the work done, being responsible for it, and controlling it." If this, interpreted literally, may imply more than is humanly possible, there is no question that, officially, it suggests a very full life both with respect to the authority and responsibility of the borough engineer.

* * *

The Royal Sanitary Institute.

The syllabus for the fifty-eighth course of lectures and demonstrations for sanitary officers which are to be held from September to December this year under the auspices of the Royal Sanitary Institute has recently been issued, and we cordially commend it to the attention of those of our readers who are within reach of the *venue*. The course comprises four lectures on elementary physics and chemistry in relation to water, soil, air, ventilation, and meteorology, seven lectures on meat and food inspection, and twenty-one lectures on public health statutes, the practical duties of a sanitary inspector, building construction, and municipal hygiene, including the prevention and abatement of nuisances, sanitary defects in and about buildings and their remedies, water supplies, sanitary appliances, drainage, refuse removal and disposal, offensive trades, and disinfection. In addition to the lectures, and in connection with them, a number of inspections and demonstrations have been arranged. All the lectures are being delivered by well-known experts in the respective subjects, and although they are primarily intended for sanitary inspectors, much of the ground traversed is of great importance and interest to young municipal engineers. It is pointed out on the syllabus that in preparing for the duties of a sanitary inspector, although a large amount of knowledge can be advantageously obtained in class lectures and demonstrations, a great part of the work of preparation must necessarily depend upon individual study, and observation on the part of the student. Conversely, however, the youthful municipal engineer or pupil should take every opportunity of supplementing his practical work by listening to lectures by experts on those subjects which most closely touch his profession.

* * *

The Aftermath of War.

We have no desire to be pessimistic or to cause needless alarm, but we are bound to draw attention to one of the most serious results that necessarily follow a bloody warfare such as that which is now raging on the Continent within a few miles of our shores, and that is epidemic disease. When we consider the thousands of corpses of men and horses which there is not time to bury or burn, and which must now be strewn over almost the greater part of Belgium and a part of France, we must realise that there exists a grave source of polluting danger to an enormous area. Past history has shown us that very serious epidemics have always followed great battles, and although modern science has been the means of allaying very serious outbreaks of epidemic diseases, it would be useless to disguise the fact that such a danger threatens us, and that we should make strenuous exertions now in the direction of alleviation, if not prevention, so as to be prepared for the worst. Decomposing organic matter is always a dangerous neighbour, and now that we know the active part played by flies in spreading disease, we must not be surprised if before long the horrors of man's war upon man is followed by Nature's inevitable punishment. The duty of every citizen at this time is plain: it is to be prepared, to keep everything as sweet and clean as possible while we have this breathing space, to see that our own bodies are clean and in good health, to see that our water supplies are well protected from possible contamination, and in fact to see that our municipal authorities are doing even more than usual in their fight against epidemic diseases. If this is done we shall be prepared for the insidious foe that always follows on the footsteps of war.

* * *

Help to Farmers in Time of War.

Mr. C. F. Gettings, the energetic county surveyor of Worcestershire, is to be heartily congratulated on the scheme he has adopted for rendering assistance to the farmers in his county during this time of peril and stress. Worcestershire—all honour to it!—has responded bravely to the call to arms, and as a result the farmers in some districts found themselves rather short of labour. Mr. Gettings, appreciating the national importance of the harvest being got in as soon as possible, and with the least chance of loss, instructed his divisional surveyors, wherever they found they could do so, to render farmers every assistance in this direction, and, if necessary, to stop the roller gangs for the time being. In this way something like 400 men became available to render their assistance, and the scheme has been found to have been of the greatest use, very good progress indeed having been made with the harvest. This is as it should be. We trust that in every county throughout England the county authorities will do all they possibly can to encourage men to fight for their country, but at the same time be ready to assist farmers and others who might thus become short of labour. We need men in the fighting line to support our gallant little army in the field, and the moral effect alone on our cruel and vindictive enemy would be tremendous if they knew that Great Britain was prepared with a large army of men ready and anxious to avenge those who had fallen in the defence of their country.

Modern Methods of Road Construction and Maintenance.

WHAT MUNICIPAL ENGINEERS ARE DOING.

[illegible]

BEXHILL.

Mr. George Bell, Assoc.M.Inst.C.E., Borough Engineer and Surveyor.

[illegible] the traffic may be considered [illegible] trolleys.

[illegible] Any roads requiring repairs have, as far as practicable, been repaired in the winter months so as to [illegible] being and a sufficient length of time [illegible] have adopted a good [illegible] the main arteries of traffic the roads and streets that have been tar-sprayed during the last five years have not been repaired; the tar and grit has formed an impervious coating on the surface, and the appearance is equal to tar-macadam roads.

In 1913 the area tar-sprayed was [illegible] sq. yds. on main roads, and 187,175 sq. yds. on other roads, and although the price of tar has considerably increased [illegible] per square yard [illegible] in 1913 [illegible] in tar-spraying [illegible] and [illegible] exceed 1·38d. In 1907 the cost of road watering for the summer season was £603. The estimate for road watering this season is only £60.

A number of our secondary roads that have been tar-sprayed are in a better condition now than they were five years ago, and will not require tar treatment this season.

The borough has grown very rapidly during the past eight years, and some miles of private street works have been added, but, owing to the many advantages of tar-spraying, the expenses of cleansing and scavenging have not increased to any appreciable extent, and street watering has practically been abandoned. We have not only got rid of the dust in summer, but we [illegible] water. The only use we have [illegible] for our rotary broom is for sweeping the roads preparatory to the tar-spraying in the season, and the road scrapers and slop carts have never been required since the introduction of the tar treatment.

In the abatement of the dust nuisance, in the less amount of cleansing necessary, and in the reduction of the repairs, the results of the application of tar have been very satisfactory, and the longer it is continued the greater will be the advantage so far as it affects Bexhill-on-Sea.

BLACKPOOL.

Mr. John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor.

The heaviest traffic here is the ordinary high-speed motor traffic, and the only satisfactory road surface which I have found is high-class tar-macadam, made of specially selected grey limestone, at least 4 in. in thickness, on a foundation of hand-packed rubble, 7 in. in depth. This form of road is at once dustless, noiseless, and is greatly superior in point of wear to any form of water-bound macadam.

The cost is by no means prohibitive, there being the first cost of foundation about 1s. 9d. per square yard, and 4 in. of tar-macadam being laid at a cost of 2s. 3d. to 2s. 6d. per square yard, or a total of 4s. to 4s. 3d. per square yard.

On the streets where the traffic is heaviest, at [illegible] years of [illegible] upon.

DUMFRIESSHIRE

Mr. Albert V. Hart, Surveyor to the Dumfries and Annan Districts.

The traffic on the 400 miles of county roads under my charge continues to increase at a very rapid rate. The new traffic is practically all of a mechanical nature. Besides the heavy touring traffic coming from the south and crossing the border at Gretna Green, and passing [illegible] the trunk roads going to Glasgow and Edinburgh respectively, there is an exceptionally large amount of local motor traffic to provide for, including the traffic created by the erection of the extensive new Arrol-Johnston motor works, near Dumfries, which at the time of writing were testing about fifty cars per week on the public roads in the vicinity. There are about thirty traction engines at the district, which are used extensively for hauling purposes in connection with agriculture, and heavy motors for trades purposes are steadily increasing in numbers. In addition to this heavy self-propelled traffic, there is an annual rainfall of between 30 and 40 in. to contend against, so that the keeping up of the roads to a desired standard is not only a difficult matter to the surveyor, but a serious one to the local ratepayer.

It was found necessary about fifteen years ago to start strengthening the roads so as to make them more suitable for the traffic of traction engines, which were being more extensively used for agricultural and hauling purposes. This traffic, which has been increasing each year, is entirely untaxed in Scotland. With the increase of this traffic there was a corresponding annual increase provided in the estimate for metal. While, therefore, the principal roads have been made sufficiently strong for the heavy traffic, the water-bound surfaces, where the motor traffic is heavy, are entirely unsuitable.

The works of improvements which have been carried out on selected trunk roads since 1911, with the assistance of grants from the Development Funds, include the widening to a uniform width of 20 ft., annual tar-spraying of village areas, and grouting all the new coatings with a bituminous binder. Ninety-two miles were selected in the county in 1911 to be resurfaced on modern principles in eight years. Additional trunk roads extending to 29 miles are to be included for grants this year for similar improvements, the work to be completed in six years, and it is expected that it will be found necessary to treat many other roads on similar lines at an early date.

The improvement works have so far given satisfaction, but it is not yet known what "life" there will be in the roads grouted and surface sealed, and for this reason I have not been able to recommend the borrowing of money for the purpose of completing the works at once. I have put down trial sections of various kinds of materials, and have gone very carefully and thoroughly into the whole of up-to-date methods, but I have not sufficient confidence that any road made with a binder of bitumen or tar will, with such a heavy rainfall and heavy traffic, outlast the loan period, unless such period is very short, and I therefore under these circumstances believe it to be the safest policy to have a clean bill at the end of each financial year, and to be in a position to discontinue any material or system when anything better is discovered.

It is recognised, and admitted, that the matter of first importance in populous areas is to provide a road free of mud and dust, and to minimise these nuisances as far as practicable in the open country. In a district with a heavy rainfall the dust question is, in my opinion, not so important as the one of providing a road (at a similar cost) which will better withstand the effects of the weather and be more durable and less expensive for maintenance. There are materials on the market at present which, at a similar cost as the materials of a tarry nature, will have a much longer life, but are not so dustless.

There is a public demand for good roads, and my council is quite alive to this demand, and willing and anxious to be abreast of the times. They are

also aware that, once the water-bound surface has given place to the new surface, it will be just about as impossible to go back to the old road as it would be to go back to the old system of consolidating the metal without rollers—and they also know that the cost of maintenance will be very heavy, but fully anticipate that this extra expense will not fall upon the local taxpayer.

GOSPORT AND ALVERSTOKE.

Mr. Herbert Frost, Engineer and Surveyor.

During recent years some of the more important thoroughfares in this district, which previously were constructed as simple water-bound granite macadam, and roads have been paved in wood blocks or granite asphalt. Outside the town area the main roads have been surface-treated with tar, and granite and hard metal has been used to a much greater extent—in lieu of gravel or flint—in other roads, where traffic is at all considerable.

HULL.

Mr. A. L. White, M.Inst.C.E., City Engineer.

Since the reconstruction of the tramways for electric working, the tramway routes have been paved with wood almost throughout, and the experience gained has led to creosoted St. Petersburg deal being regarded with increasing favour, and in the case of renewals it is replacing Australian wood, which it has been found to excel in practically every respect. A few additional streets are being paved with granite setts, but in the light of the experience with creosoted wood it is not likely that granite paving will be very greatly extended, and several lengths in front of important offices and council schools have already been taken up and replaced with wood.

For a medium class of traffic granited asphalt is being tried, but it will be some time before it is possible to pronounce an opinion upon it. Tarred macadam has not found any favour except for certain side streets. The corporation have not yet undertaken its manufacture except for patching, and only one or two of the ready-made materials have proved at all satisfactory. This district is fortunate in being able to secure a macadam which loses very little in bulk from wear, but it does not take tar at all well. For the above reasons the idea of using tarred macadam for the principal streets has been practically abandoned, but tar-spraying is regularly carried on. Most of this work is done by a Weeks machine mounted on a steam wagon, but a proportion is also done by hand. Outlying rural roads and culs-de sac are being successfully treated with calcium chloride, and some use has been made of Glutrin. The results with this material have not been quite consistent on the level, but it has been found of great advantage on gradients where tar could not be used. Many other advertised materials and methods have also been given trials, but have not been adapted on any extensive scale.

ILFORD.

Mr. H. Shaw, M.Inst.C.E., Engineer and Surveyor.

Owing to the heavy wear on the main roads through this town, it has been found necessary to lay special dressed granite setts on 9-in. concrete bed through the High-road and Ilford-lane at a cost of over £30,000. With regard to the other roads, last summer trial lengths of roads were surfaced with Trinidad asphalt macadam, Tarvia, Mexphalte and Fluxphalte.

MALDENS AND COOMBE.

Mr. Reginald H. Jeffes, Assoc.M.Inst.C.E., Engineer and Surveyor.

The change in the character of traffic within recent years has necessitated different methods of construction and maintenance of roads in this district. Prior to 1908 most of the district roads were of flint, including also secondary roads. All the secondary roads have now been converted to granite, and are tar-sprayed each year with excellent results.

Wherever any new work of widening is undertaken, either on secondary roads or important district roads, tar slag macadam, costing about 3s. 6d. per square yard, 4 in. thick, is now employed, and this form of material stands the traffic well except in certain cases, where heavy 'bus traffic has caused tracking to take place. In the latter case it is possible that either wood paving or asphalt will ultimately replace the tarmac.

The principal alteration in the form of construction has taken place on the London and Portsmouth road. The heavy traction and motor traffic on this road necessitated a departure from the water-bound method. Tar slag macadam was first tried, but this, unfortunately, did not prove equal to withstanding the very heavy traffic. Trinidad asphalt macadam, 4 in. thick, was then tried, and this method appears to stand the traffic better than any other method yet tried. A length laid down in October, 1910, is still in good order. Pitch-grouted macadam has also been experimented with, a section laid down in August, 1912, having stood remarkably well, notwithstanding the very wet weather experienced during that month. The thickness was from 3 in. to 4 in., and the cost was by no means excessive. A further section of pitch-grouted macadam is about to be undertaken on this road.

PENRITH.

Mr. J. J. Knewstubb, A.R.I.B.A., M.R.San.I., Engineer and Surveyor.

Some years ago the question of road construction was carefully gone into at Penrith, and costs were taken as to the formation of roads in ordinary macadam and tar-macadam, and also with regard to their subsequent cost of upkeep, and it was found that, taken over a number of years, and all things considered, there was decided advantage in forming the roads by tar-macadam, or using similar method, as against ordinary macadam. During the earlier stages of construction the formation of roads in tar-macadam was somewhat costly, the upper surface, say to a depth of 5 or 6 in., being taken away and replaced with tar-macadam, but a cheaper and almost as effective a method has been adopted by scarifying or loosening the surface to a depth of about 6 in., screening and removing the fine stuff, and laying the larger gauge material on the site, consolidating this with a steam road roller in a dry state, and then pouring in the interstices a mixture of tar, pitch, &c. On the top of this is laid a coating of tarred stone, varying in gauge and thickness according to the amount of traffic to be borne by the roadway in question. After this has been done a final coating of tar mixture and a sprinkling of dry gravel completes the road for traffic.

Surface dressing on ordinary macadam has been tried, but while in summer this was fairly successful, it was unsatisfactory during the frost and rains of winter.

(To be continued.)

HEALTH WEEK.

EXECUTIVE COMMITTEE'S DECISION.

The Executive Committee dealing with the arrangements for Health Work report that since they were appointed in October, 1913, they have held nine meetings and a number of sub-committee meetings, and the members of the committee and the officers have been actively engaged by correspondence, personal interviews, and circular letters in preparing for the observance of Health Week on the date fixed in November next, both in the United Kingdom and other parts of the Empire.

Their efforts had been so far successful that at a meeting of the committee on July 28th there was submitted to them a list of over 100 towns and districts that had under contemplation the observance of Health Week in some form. Many of these places had their arrangements well advanced, and it was expected that during the following three months many other centres would be arranged. In view of the present circumstances, however, it was decided that it would be necessary to postpone the arrangements for the general celebration of Health Week as originally proposed until the conditions were more propitious. At the same time, the committee consider that in places where other arrangements are so far advanced that the local committee think it desirable to continue, the arrangements should go on; but the Central Committee regret that they will not be in a position to give the material support contemplated.

The committee had before them several suggestions made for redirecting the organisation and efforts of the committee to civil and military conditions arising out of the war; but, although most anxious to afford assistance, there did not appear to be any practical way in which the committee could be of service. It is proposed, however, to have another meeting later on to consider any further action of the committee.

Claridge's Asphalt is being used on the roofs of Preshaw House, Upham, Hants, and Great Oak, Goring Heath, under the instructions of Messrs. Crickmay & Sons and Mr. F. L. Pearson respectively.

IMPROVED ROAD SURFACING IN STIRLING.

By Andrew H. Goldie,
Burgh Surveyor and Master of Works.

Owing to the increased road traffic it became necessary to improve the methods of surfacing here as in other places.

The first method tried was coating with clean hard metal and finishing with untreated gasworks' tar. This kept down the dust and acted fairly well as a surface dressing, but in bad weather the tar ran out on the surface, and in cold, wet weather it worked into a black mud, altogether being rather a doubtful improvement on the old methods.

After some further experiments with prepared tar, it was found that the most satisfactory and economical treatment for compartively light traffic roads was to put on a 3-in. coat of tar-macadam, roll hard, and leave it to be consolidated by the traffic, then clean and seal the surface with a thin coat of prepared tar. This gave excellent results on roads with good subsoil which had previously, with ordinary macadam, cost about £75 per mile for a 20-ft. width of road.

In the making of tar-macadam the stones were dried and, where possible, heated, care being taken not to overheat the stones. While hot they were mixed with tar in the proportion of 8 to 10 gallons per ton. The stones were not graded, as I find if the graded stones are not evenly distributed they form a source of weakness in the road. My best results have been obtained from cubical stones broken to pass a 2½-in. ring. The smaller stones can be used for very light traffic roads, and the gravel for blinding or gritting. The tar used was in accordance with the Road Board specification.

Cost of Making Tar-Macadam.

	d.
Metal, 1 ton at 5s. ...	60·00
Tar, 9 gals. at 4d. ...	36·00
Coal for heating, 4d.	4·00
Wages and carting, 35d	35·00
	135·00

Tar-Macadam Surfacing 3-in. Coat.

	d.
Tarred metal (per super. yard) ...	15·00
" gravel "	1·00
Wages (per super. yard) ...	1·50
Carting " ...	1·75
Rolling "	·75
	20·00

In addition to the above cost it takes 1½d. per yard to tar-paint and grit the surface of the road.

HEAVY TRAFFIC ROADS.

The real difficulties encountered were on the heavy traffic roads—namely, those costing £200 per mile for a 20-ft. width of road. Before starting to improve the surface of such a road one had to make certain that the bottoming was in good condition, and where the subsoil was weak this had to be treated and made to bear the bottoming, either by draining, increasing the depth of bottoming, or on soft clay putting a heavy coat of ashes below the bottoming. This, when rolled into the clay, stiffens it and improves its bearing qualities.

For treating the surface of such a heavy traffic road something better than ordinary tar-macadam is required. There are in the market various special tars claiming to have a certain proportion of bitumen, but all are fairly expensive.

One of our heavy traffic roads similar to what has been described was surfaced two years ago with bituminous macadam. This was put on from 4½ in. to 5 in. thick, and rolled down to 3½ in., and then blinded with tarred gravel. The surface in summer is admirable, but in the winter months the wear is very heavy, as the protecting surface is torn off by the wheels of the large chars-à-banc and commercial motors. Especially is this the case with a morning thaw after a night's frost, so that when the heaviest wear is taking place the surface from its nature cannot be repaired, and when suitable weather occurs for the repair the cost is all the greater because of the delay.

The tar used was as formerly described, this being mixed with 20 per cent of best Mexican bitumen, and after being down a few weeks it was surface-coated with the same mixture and gritted with hard whin chips.

Three different qualities of stone were used, one being a hard, keen stone standing a great crushing strain, one a good hard whin, but not so keen as the first, and the third a good moderate whin. It was found that the keen stone had not taken a proper grip of the tar, and the suction of the motor wheels tended to bare this stone by removing the particles of tar which in the cold, damp weather had become pulverised by the heavy traffic. The medium stone held the tar better, and the softest stone best of all. This roadway was seal-coated in the following summer with tar and bitumen as formerly, part being coated with proprietary bitumen which did not give such good results.

Cost of Bituminous Tar-Macadam.

Material and Mixing.

Material	Quantities per sup. yd.	Price per sup. yd. d.
2½ in. metal ...	·125 ton	9·888
⅜-in. gravel...	·015 "	1·98
Prepared tar ...	·886 gal.	2·918
Mexican bitumen ...	·221 "	1·564
Wages, tarring metal ...	·587 hour	3·524
Carting	·009 "	·090
Power, mixer, boilers, &c.		1·236
		20·418

Laying Metal and Blinding.

Wages, laying & scarifying	·331 hour	1·987
Carting	·185 "	1·856
Rolling	-	·598
Repairing tools, &c. ...		·186
		4·627

Surface Painting.

Wages ...	·096 hour	·578
Carting ...	·016 "	·166
Tar	·250 gal.	·758
Bitumen	·062 "	·444
Sand and gravel ...	—	·250
Tools, &c. ...		·005
		2·201

Abstract.

Material and mixing	20·418
Laying metal and blinding ...	4·627
Surface painting	2·201
	27·246

Part of this same heavy traffic road was surfaced with Rocmac at the same time as the remainder was surfaced with bituminous macadam. The part chosen for the Rocmac was between high banks and overshaded with trees. This portion of the roadway has proved slightly dusty in summer, but not so dirty in winter, and has the great advantage of being repairable in almost any weather. The cost is a little cheaper than bituminous macadam, and it has the further advantage of not requiring an expensive paint with a bituminous mixture every summer. It has a hard, metallic surface, but gives a good foothold to horses, and has less resistance to traction than bituminous macadam. For cost of upkeep it certainly compares favourably with the bituminous macadam, although it has been placed in the worst part of the road.

Cost of Rocmac.

Description of material, &c.	Quantities per sq. yd.	Price per sq. yd. d.
Wages	·702 hour	4·211
Carting	·137 "	1·372
Metal	·111 ton	9·390
Limestone chips	·038 "	4·871
Rocmac solution	·544 gal.	4·898
Sundries	—	·924
		25·666

Proposed Improvements at Scarborough.—An extensive scheme of development on the North Side was indicated at the meeting of the Scarborough Town Council in committee recently. The Estates sub-committee put forward a number of recommendations. The most important of these was the proposal to construct a bathing pool on the North Side. The site of this pool is to be immediately south of the Peasholm slipway. It will be similar in shape to the one on the South Side, and will be formed immediately under the sea wall. The estimated cost is about £10,000. It is also proposed by the sub-committee to erect twelve more bungalows, on the crescent-shaped site immediately above the present bungalows.

Town Planning Problems in Partially Developed Areas.*

By FRED W. PEARCE, Engineer and Surveyor to the Twickenham Urban District Council.

[illegible] the passing of the Housing, Town Planning, [illegible] Act, 1909, the subject has been [illegible] in the form of discussions at various [illegible] of local authorities and their officials, and nearly all possible views have already been [illegible] in the various papers which have been [illegible] on the subject.

With comparatively few exceptions, the papers submitted [illegible] have been [illegible] from the theoretical side, owing to the limited extent to which practical experience in the actual working of the Act was available. The consideration of the subject in connection with the actual preparation of a town planning scheme [illegible], and it may probably serve a useful purpose to enumerate briefly a few of such problems in the hope that the considera[illegible] in the preparation of town planning schemes.

DESIRABILITY OR OTHERWISE OF PREPARING A TOWN PLANNING SCHEME.

The first of such problems in point of order is the desirability or otherwise of taking steps to obtain the sanction of the Local Government Board to the preparation of a scheme. . . . This can only be decided after full consideration of all the aspects of the matter as affecting the particular district. In all cases, however, where there is any considerable area of land in course of development, or in respect of which there is any probability of development taking place within the next ten or twenty years, a *primâ facie* case for the preparation of a scheme may probably be considered to exist. In such cases it will, no doubt, be conceded that the advantages to be derived in securing a larger measure of control in the development of the district are ample to justify the expenditure which the authority may thereby be called upon to incur. In fact, the general adoption of the Act by all local authorities of districts in course of development may be regarded as fairly certain within a comparatively short period.

NATURE AND EXTENT OF LAND TO BE INCLUDED.

Having decided to prepare a scheme, consideration must next be given to the actual area to be included, and as to the advisability of including land outside the area of the local authority, and lands already built upon or not likely to be used for building purposes. . . . In the case of the Twickenham town planning scheme, lands within the area of three other local authorities—two of which are situate on the opposite side of the river Thames—were included in the original application. As the result of negotiations which subsequently took place, each of such local authorities agreed to prepare a town planning scheme for their respective areas, with the result that the districts of Richmond, Heston and Isleworth, Ham and Twickenham, all of which abut in part on a portion of the river Thames, have applied for authority to prepare schemes in respect of a total area of approximately 9,200 acres. While the circumstances are, in this instance, probably somewhat exceptional, there are no doubt numerous other cases in which a similar course of mutual action on the part of neighbouring authorities will afford the best means of preserving the amenities of, and securing the most effective method of development for, the respective districts.

The extent to which it may be necessary to take advantage of the provisions of sec. 54, subsec. (3), with respect to the inclusion of lands already built upon or not likely to be used for building purposes requires careful consideration. As a general rule, the advice "when in doubt include" may be recommended for acceptance. It must not be overlooked, however, that the inclusion of such land is subject to the consent of the Local Government Board, and that the onus of proof as to the necessity for such inclusion will rest upon the local authority. In cases where the character of the district is undergoing any appreciable change, such as the demolition of existing buildings and the erection of buildings of a different class, the inclusion of considerable areas of land already built upon may be of [illegible] in the event of this not being done, large buildings standing on land of an acre or upwards in area may be pulled down, and a number of small buildings crowded on the same area. In fact, the value of the land for this purpose may be substantially increased by the inclusion in the scheme of the undeveloped land in the district.

ROADS TO BE PROVIDED TO BE MADE AS PART OF THE SCHEME.

In cases where the construction of new roads as [illegible] the purpose of improving means of communication or assisting in the general development of the district, the planning of such roads must necessarily be the first problem to be considered, as various other problems will depend largely upon the line and direction [illegible] they are intended to serve. The lines of what have hitherto been described as arterial roads will require the first consideration, and will necessitate a large measure of intelligent anticipation with respect to future traffic development. Consultation with the adjoining local authorities is also essential, and much careful sifting of the various points for and against any arterial road, and the suggested line of such road, will be necessary in order to arrive at a solution which will most efficiently meet the probable future traffic requirements, while at the same time inflicting the minimum amount of present inconvenience and probable pecuniary loss. . . .

It would be impossible in a paper of this description to deal with the various points which must of necessity arise in a problem of such magnitude; but it may be suggested that, in cases where the construction of a new road for the purpose of effectively dealing with traffic passing over from any large [illegible] population would involve the diversion of such traffic from an existing business centre, it should be made a condition that no trade or business premises be allowed to be erected along such line of road. Not only would such a condition serve to reduce the possibility of hardship and pecuniary loss to existing traders, but the primary object of a through traffic road—viz., the provision of improved transport facilities—would be enhanced by the elimination of the obstruction so often created in important thoroughfares, by reason of slow-moving traffic and the loading and unloading of goods outside business premises.

The next point for consideration is the planning of roads intended chiefly for local intercommunication or linking up the various parts of the area. In most districts natural or artificial barriers exist, such as rivers, canals or railways, which render intercommunication difficult, and under existing methods of development this difficulty has even been accentuated by the haphazard method in which new streets have been laid out. It should be one of the chief objects of a town planning scheme, particularly in partially developed areas, not only to lay out such new lines of roads as will reduce, so far as practicable, the inconvenience which is inseparable from the existence of such natural or artificial barriers, but also to reduce the number of culs-de-sac, which are so common a feature of many suburban districts.

This question is essentially one which should be approached, at any rate in the early stages, without any undue stress being placed on the question of initial outlay. To secure satisfactory results, bridges may have to be constructed and existing buildings pulled down; but the town planning enthusiast who expects to make bricks without straw will be sadly disappointed.

Having decided upon the lines of roads which are necessary for either of the purposes already indicated, the question of what may be described as estate roads remains for consideration. The extent to which it is desirable to prepare an actual development plan, including the lay-out of streets and the position of buildings, is a matter upon which there is probably some difference of opinion. It is suggested that, in most cases, however, the attempt to include detailed planning of this description would cause much unnecessary delay in the preparation of the scheme, and that the result obtained would be in no way commensurate with the troubles and difficulties which would thereby be involved.

ROAD CONSTRUCTION AND COST.

The method of road construction, and in what way the cost of such construction should be dealt with

* Paper read at the Annual General Meeting and Conference of the Institution of Municipal and County Engineers at Cheltenham.

[illegible] consideration. The [illegible] principal [illegible] in some instances, be left to be dealt with as and when the occasion requires, or, if [illegible] as to be necessary in connection with the immediate development of the district, such roads may be constructed of the ordinary by-law width, with [illegible] either on one or both sides to provide for future widening. In the case of roads, however, which are necessary for opening up and improving intercommunication within the district, provision for the early construction of such roads is desirable in order to secure the immediate advantages which should accrue to the district from a well-designed scheme. This could, in most cases, be ensured by the inclusion of the necessary provisions to enable the scheme to be approved by the local authority, either on their own initiative or at the request of the owners of the land across which such roads are intended to be constructed. In the case of these roads also the initial width should be governed by the present road conditions, subject to a similar provision to that in the case of arterial roads for future widening. In the meantime, full advantage should be taken of the opportunity to deal with the land, not actually laid out as carriageway or footways, in such a way as to add to the amenities of the district. . . .

PUBLIC AND PRIVATE OPEN SPACES.

It is doubtful whether any useful purpose would be served by any attempt to lay down any general rule as to the area of open space which should be provided, but as a comparative standard, one-fifth of the total area may be suggested, of which one-tenth may be allotted as private and the remainder as public open space. The relative proportion of these two classes will, however, depend largely upon the character of the district, and the method of administration adopted in connection with the future upkeep and maintenance. . . .

The location of open spaces should be such as to secure reasonable facilities for access, and to preserve the general amenities of the district. The first of these objects suggests the desirability of providing open spaces, particularly playing fields, in close proximity to the principal lines of communication, and should therefore be considered in conjunction with the planning of any new roads proposed to be made as part of the scheme. The second object involves the preservation, as far as it may be practicable, of objects of natural beauty, and attention may again be directed to the desirability of protecting rivers, brooks and streams, by the retention as open space of strips of land along the banks. In addition to parks and playing fields, adequate provision should be made for children's playgrounds placed in close proximity to their homes, and away from the main arteries of traffic. . . .

LIMITATION AS TO NUMBER, HEIGHT OR CHARACTER OF BUILDINGS TO BE ERECTED.

It is essential that very careful consideration should be given to the allocation of purely residential areas, and to the extent to which the limitation of the number of houses to be erected can be fairly applied. Even where this has been done it will probably be found impossible to meet the objections of a certain number of owners, but these may safely be left to be dealt with by the Local Government Board. . . . It would, however, probably serve to remove a number of objections if consent could be obtained to the insertion in the scheme of provisions for securing alteration or revision of the limiting provisions, should this be subsequently found necessary or advisable, in consequence of any material alteration in the circumstances or conditions which existed at the time when the scheme was originally prepared.

In addition to the limitation of the number of buildings to be erected to the acre, it is desirable to provide that only a definite portion of the site shall be covered with buildings, and that such buildings shall not be used as tenements except in compliance with special restrictions with regard to number of tenements, with a further restriction, if considered advisable, as to the number of buildings to be allowed if divided into tenements. It may also be advisable to require a minimum area of site for each building, and to limit the height of the buildings to be erected.

Closely connected with the location of residential areas is the provision of suitable business centres, including such shopping facilities as may be necessary for meeting the daily needs of the locality. . . . The only safe plan, apparently, will be to provide well-defined shopping centres, and to keep the residential areas entirely free from any kind of trade or business premises.

The allocation of sites for factories and workshops will almost entirely depend upon the character of the district, and the nature and extent of any trade or manufacture connected therewith. The necessity for adequate transport facilities must, however, be borne in mind, and land adjoining railways, rivers and canals will naturally be selected as suitable sites for such purposes. In the case, however, of land adjoining natural rivers or streams, the effect upon the amenities of the district should be carefully considered before definitely allocating any of such land for purposes of trade or manufacture. . . .

ESTIMATED COST OF CARRYING OUT THE SCHEME.

The importance of careful consideration being given to the question of probable expenditure is clearly indicated by the provisions of Article XVI. of the revised Procedure Regulations, which require, in connection with the application for approval of a scheme prepared by a local authority, that separate particulars of the estimated cost of carrying out the scheme should be given under the following heads:—

Expenditure.—Purchase of land for open spaces; purchase of land for other purposes; purchase of buildings; demolition or alteration of buildings; compensation in respect of property injuriously affected by the scheme; making or alteration of roads or ways; sewerage or drainage; cost of preparing the scheme; other purposes.

Receipts.—In respect of all property increased in value; from other sources.

It is, of course, probable that a scheme may not necessitate expenditure under each of such headings, and it is also a fair argument that expenditure under such headings as sewerage or drainage would be necessitated in connection with the development of a district, independently of any question of a town planning scheme. After making full allowances, however, in respect of such circumstances, the question of cost will remain as one of the most important items in connection with the scheme, and in dealing with any considerable area there is little doubt that the effective value of a scheme will bear a direct relation to the expenditure incurred.

On the other hand, it does not necessarily follow that estimated expenditure will become immediate actual expenditure. In most cases the provisions contained in a scheme will come under two distinct headings, one of which will include provisions operative within a certain time, on the part of the local authority or the owner of the land, and the other, those which are to a large extent permissive and only require works to be executed in a certain way if executed at all.

There is the further probability that some portion of the estimated expenditure will be conditional upon the nature and extent of the development of the district, and might, therefore, be regarded as to some extent provided for by increase in rateable value. Such considerations may fairly be taken into account, and it would probably serve a useful purpose to approximately allocate the estimated expenditure for periods of, say, five, ten, fifteen and twenty years.

A short discussion followed the reading of the paper at the recent annual meeting of the Institution of Municipal and County Engineers at Cheltenham.

Mr. E. Willis (Chiswick) said he believed in compulsory town planning, seeing that there were so many local authorities where the members had vested interests, and where undoubtedly they would like to do good work, but where they felt that their own interests, or those of persons dear to them, would be seriously affected, with the result that they hesitated before they adopted the provisions of this important Act. Therefore the time had come when the Government should give a limited period for the adoption of the Act, and make it, or some modification of it, compulsory within three or five years. If that were done there would be good hopes of the country getting some good results for the future. He did not suggest that fully complete schemes should be made. Let preliminary plans be made showing the area, so that the local authority had some power over the development of the land. With regard to the inclusion of large areas of urban authorities, Mr. Pearce had admitted that his authority had made a mistake. It was a rather serious matter if a new arterial thoroughfare was to be allowed to take away the trade of an old arterial thoroughfare, and therefore, in dealing with new arterial roads, there should be some pro-

vision which would prevent roads being set up in opposition to those that had had the trade. In the country we were not called upon to deal with skyscrapers of the New York type, but special provisions were needed to govern the height of buildings. He proposed a vote of thanks to the author of the paper.

Mr. H. E. Spencer (Birmingham), who seconded, advised authorities not to exclude any area from their town planning schemes. He was sorry that any portion had been excluded from the Birmingham scheme.

Mr. A. J. Reeves (Hoylake) said he had in his district villages where, when he purchased a new engine and one or two stoves for the sewage works, it increased the rates. When a 1d. rate would only bring in £10 or £1, they would see the extreme difficulty in the way of a surveyor of a district council suggesting that money should be spent on town planning.

Mr. H. G. Whyatt (Grimsby) said the Local Government Board, in a scheme with which he was acquainted, had allowed the compulsory purchase of all undeveloped land, but they refused to give power over the whole district, or to prevent villas being turned into factories.

Mr. F. J. Smillie (Tynemouth) remarked that, to say a town planning scheme must be compulsory to compared by the Local Government at the present time was to retard the whole movement.

Mr. T. Adams (Local Government Board) said he could assure them that in considering Mr. Pearce's scheme he spent days in trying to solve the problem which houses he should include and he thought Mr. Pearce, in his generous scheme, would admit that the board included as much as possible. Mr. Pearce's point was that if a scheme were worth having, an authority must bear some share of the cost of carrying it out. Any scheme, to be of value, must cost an authority something as well as put some restriction on the owner, but the cost would be spread over a period, so that the authority would not feel it.

Mr. J. A. Angell (Beckenham) considered that in the suburbs of London town planning should be more or less compulsory. The suburbs were in competition with each other, and when one district took on a scheme the objection raised by ratepayers was that they were about to impose restrictions on houses which would raise the rates and drive out people who would otherwise live there. The Local Government Board might very well give a lead as to the number of houses per acre.

Mr. Pearce, in reply, explained that his authority, after preparing a town planning scheme, allowed building to go on subject to the owner acting in accordance with the council's views. In this period of transition it was necessary to meet the owners as far as possible.

MAINTENANCE OF BELFAST STREETS.

COST OF CLEANSING AND REPAIR.

The provision made for the repair and cleansing of the streets of Belfast and for the carrying out of improvements by the works department of the corporation during the year ended March 31st last is dealt with in the annual report of the superintendent of works (Mr. Hector F. Gullan, M.INST.C.E.), who states that in the course of the year 3 miles of streets were added, making the total mileage of public thoroughfares throughout the city 309 miles, including, in round figures, 144 miles of pebble-paved carriageways and back passages, 25½ miles of sett-paved carriageways, 135 miles of macadam, 1 mile of wood paving, 3½ miles of tar-macadam, and 30 yds. of asphalt.

The estimated expenditure on general repairs for the year was £30,000, and the actual expenditure £28,915. The cost per mile was £93·64 as compared with £118·07 ten years ago. For street cleansing the estimated expenditure was £31,950, and the actual expenditure £30,877. The cost per mile was exactly £100, as compared with £120·86 ten years ago. The total number of street cleansings amounted to 345,272, which constituted a record, being 1,679 over the highest previous total. The number of loads of sweepings removed was 87,823. Upwards of 23,000,000 gallons of water were used for street watering, and the average daily staff of men employed was 322.

Llansannan Waterworks.—The Local Government Board have sanctioned the borrowing of £1,000 for new waterworks at Llansannan, near Denbigh, and the work is to be put in hand after the harvest.

SHOULDERS FOR CONCRETE ROADS.

By W. W. Crosby, Baltimore, Maryland.

[Mr. Crosby, in a letter dated August 18th, states that he has read with great interest the editorial on "The Edges of Road Crusts" in our issue of August 7th, and forwards for publication the subjoined report prepared by a committee of which he is chairman, and presented at the National Conference on Concrete Road Building held recently in Chicago.]

With the almost universal tendency in concrete road construction to keep the width of the concrete as low as practicable, in order to reduce the first cost (per mile) of the improvement of a road, has come, in many cases at least, the neglect of proper consideration of the matter of shoulders. In many cases the neglect referred to has unquestionably resulted in extravagance and waste in the long run, even if it has secured economy in first cost.

While authenticated records covering reasonable periods and concerning the relative expense for the proper maintenance of road crusts and of shoulders respectively are not readily available, certain instances of such record (as published concerning Park Heights-avenue, near Baltimore, Maryland),* together with the individual experiences related by many authorities, tend to show that the shoulder maintenance costs may be no considerable part of the total maintenance costs of a modern road, and that it may often be real economy to build the road crusts wider in order to reduce this annual expense for maintaining the shoulders, and thus the total maintenance cost per square yard. From the Park Heights-avenue records, above referred to, it may be seen that, although the travel over the 24-ft. wide sections was four times that over the 12-ft. and 14-ft. sections, the cost of maintenance per square yard of the road crusts of the latter was more than twice that of the crusts on the wider sections, and the cost of maintenance on the shoulders on the narrower sections was nearly three times that for the shoulders along the wider crusts. Indeed, the economy in maintenance on both the shoulders and road crusts of the wider sections indicates that, in a ten-year period from the date of construction, real economy would have been had by increasing the width of the road crusts so that nowhere would the latter have been less than 18 ft.

But the subject for consideration is not "The Economical Widths of Road Crusts," but "Shoulders for Concrete Roads," and after the above specific illustration of the importance of shoulder consideration that of the actual subject may be resumed.

The actual width of the concrete roadway to be built must be determined by the traffic conditions to be expected on the road, and if these are sufficiently heavy to warrant so doing, it will probably be economical often to make the concrete itself wide enough to permit the passing of two lines of traffic wholly on its surface and without any necessity for either of passing vehicles to travel off the concrete on to the shoulder. On the other hand, traffic and other conditions may be such as to permit the greatest economy to be had by making the concrete only wide enough for one line of traffic and allowing the occasionally passing vehicle to travel on the shoulder for the moment.

The immediate vicinity of the line of contact between the edge of the concrete and the shoulder material will be found to be the tender region of both the road crust and of the shoulder. The high rigidity of the concrete road, and consequently the greater contrast between such a road crust and other material usually available for shoulders, increase the importance of the careful consideration in the matter.

Where the concrete road crust is so narrow that vehicles are almost constantly, in avoiding others, passing from the concrete to the shoulder, serious wear of both the road crust and the shoulder will be found to take place along the region of contact referred to, and this wear is frequently accompanied by the formation of a rut in the shoulder, which holds water in wet weather and thus endangers the foundation of the road. Some of the passing traffic will undoubtedly turn out on to the shoulder further than the rest, but at the extreme outside of the shoulder the travel over it may be so light and infrequent that the natural material there is not strained beyond what might be called "its elastic

* "Proceedings," American Society of Civil Engineers, Vol. xxxix., No. 7, page 1706, &c.

[illegible]

[illegible] material and methods for the construction of [illegible] extremes, and the concrete itself; that the choices are determined by local conditions, such as availability of different materials and methods, width of [illegible] and that the wearing abilities or "elastic limits" of [illegible]

The passage of traffic from the pavement to soft [illegible] vented, and the protection of the edges of the pavement be had by the installation of a raised edging or kerb, as in the cases of most streets. The necessary reinforcement of the shoulder where no raised kerb is to prevent traffic on it may be had in various ways. One would, of course, be to widen the concrete road crust to such an extent as to preclude [illegible] the centre thickness of the crust need not necessarily be preserved to its edges, but the thickness may be tapered down somewhat at the outsides. Or this widening (and tapering down in thickness) of the road crust may be done over a portion of what might otherwise be the shoulder, and then the reinforcement continued by the use of macadam or pitgravel or other materials as may be necessary. Again, the width of the concrete road crust being fixed, the shoulder reinforcement may be had by the construction of pitch-concrete, pitch-macadam, water-bound macadam (with or without a pitch carpet), &c., adjoining the concrete road, all as may be necessary and desirable under the local conditions. The actual determination must be left to competent parties who will give due consideration to the local conditions and the principles referred to above.

This committee therefore endorses with its approval and recommends the adoption by this body of a clause similar to that in the recent report of the Special Committee (on Bituminous Materials for Road Construction, &c.) of the American Society of Civil Engineers, and as follows: "Where cement-concrete pavements are laid the edges should be [illegible] pavement to any softer shoulder material avoided by means of cement-concrete or other edgings, or such reinforcement of the shoulder material as may be necessary."

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Resistance of Steel Conductor Rails.—The great attention which is now being given to the question of the electrification of railways and the number of undertakings in hand and projected, makes a recently issued report on the British standard method of specifying the resistance of steel conductor rails of special interest at the present time. The question was brought officially to the notice of the Engineering Standards Committee in March, 1913. It was then suggested that a conference of those interested should be held with a view of endeavouring to arrive at some general agreement as to the method to be employed in the future. This conference was held, and the result of the labours of the members, all of whom are prominently associated with railway and tramway work, was submitted to the Sectional Electrical Committee and the Main Committee of the Engineering Standards Committee, and is now issued as Report No. 68. In the introductory remarks an explanation is given of the reasons for selecting the particular method which has been adopted of defining the standard dimensions in terms of length and weight per yard, rather than in terms of length and sectional area. Useful tables of reduction factors for converting the resistance of a rail of known weight measured at a given temperature to its value in terms of the standard are included, and in an appendix will be found reduction formulæ so that previous values for the resistance of rails in terms of copper may be readily reduced to values in terms of the recommended standard. The price of the report is 10s. 8d. post free, and it may be obtained from any bookseller or direct from the offices of the committee, 28 Victoria-street, Westminster.

THINGS ONE WOULD LIKE TO KNOW.

(Continued.)

Are not the following lines of Alfred de Musset very worth considering to Britons at the present crisis (if not always)?

Rise, for the day is passing whilst you are dreaming on,
Whilst others have buckled their armour and forth to the battle gone,
A place in the ranks awaits you, each man has his part to play,
Think not on the past or the future in the face of the stern to-day.

Could not all surveyors and other readers of this [illegible] men in their service that unless they take steps at once to help their country by enlisting there may come a time when they will bitterly regret that they did not take part in the protection of their hearths and homes?

* * * *

Is it not interesting to hear that in response to the "appeal" to the members of the Institute of Sanitary Engineers indicating how they could assist their country in their positions as civilians and non-combatants, thirty-two members replied that they were prepared to join a Sanitary Company of Territorials should they be required, and that the council of the Institute believe they could raise such a company of sanitary experts sufficiently numerous to form a special unit for sanitary service?

* * * *

Is it not also creditable to this institute to find that fourteen other members are prepared to give their whole-time services in assisting local authorities whose regular staff of sanitary officials has been reduced by those who have been called away to fight for their country, and that forty-three other members are prepared to give part-time service?

* * * *

Is it not, on the other hand, to be regretted, if what we hear is true, that although the clerks and better-class men of this country are answering Lord Kitchener's "call to arms" in large numbers and showing the true manly spirit, the labouring classes, which are largely in the preponderance, are hanging back and are not responding in the manner which one would expect of all true Britishers? Is it not also a regrettable fact that in the country districts there appears to be a sort of apathy, one might almost say ignorance, as to the reasons for the war?

* * * *

Cannot the Labour Party be induced to see matters in the light that unless we convince the enemy that we are in deadly earnest the war will be unduly prolonged, with results which can only be disastrous to the labouring classes? Accordingly, should they not use their influence to encourage those whom they represent to respond in greater numbers to the "Call to Arms"?

* * * *

Should we not take to heart the motto which inspires our splendid Navy in all their work—"Do IT NOW," and be prepared to act accordingly?

* * * *

Apropos of this motto, are not the surveyors throughout the country to be congratulated on the prompt manner in which they have responded to the demand for the preparation of schemes for relief works; and does the general public realise the enormous amount of extra work that the preparation of such schemes has thrown upon these officials?

* * * *

How will the £4,000,000 voted by Parliament for housing the working classes be spent, and is it not to be hoped that it will not, either directly or indirectly, be used for political purposes? Is there not always some danger of this so long as party questions enter so largely into the government of this country?

* * * *

Will not the excellent plans and description of a scheme for building houses for the rural population which were given in last week's issue of THE SURVEYOR be exceedingly helpful in the direction of the preparation of schemes when the country is in a condition to proceed with the work?

* * * *

Was the inquiry held by the Local Government Board at Melton Mowbray on the 2nd ult. as to the complaint that the council of that place had not exercised their powers properly under the Housing Acts the first that has been held under these Acts; and what will be the result?

THE WAR.

CHADWICK TRUST AND SANITARY ORGANISATION.

In view of the immediate importance of [illegible] sanitary organisation in the naval and military services during the present campaign, the Chadwick Trustees have resolved to award, at the close of this year, the Chadwick Gold Medal and £50 each to the naval and military medical officer respectively in the British service who shall have distinguished himself most in promoting the health of the men in the Navy and Army. The competition for these presentations will be made by the Director-General of the Naval and Military Medical Services. The Chadwick Trustees are also making arrangements for providing, or assisting in the provision of, lectures and demonstrations on naval, military and hospital hygiene. Particulars of these lectures will shortly be announced.

PRECAUTIONS AGAINST EPIDEMICS.

In the House of Commons on Monday the President of the Local Government Board was asked what steps were being taken to prevent any epidemic of disease occurring in this country in consequence of the arrival of refugees and others from those parts where disease was likely to be. Mr. Herbert Samuel stated in reply that, although there was no reason for any immediate danger of the kind suggested in the question, the Local Government Board were fully alive to the necessity of taking precautions. When they learnt a few days ago that a considerable number of refugees were coming in from the Continent, the board sent a medical inspector down to the port to make a special examination of those who arrived. Two days ago they sent a reminder to local authorities of their duties in connection with the prevention of smallpox, with instructions as to the course to be taken in the event of an outbreak. He could assure the hon. Member who had put the question that the Local Government Board were exercising every vigilance to safeguard the health of the people.

BUSINESS AS USUAL.

While a number of firms connected with the road-making and building industries are finding their business very considerably interfered with at the present time in consequence of the sudden cessation of all business with Germany, the Limmer Asphalt Paving Company, Limited, whose freehold mines are situated in France, and who also draw large supplies from Ragusa, Sicily, inform us that they are in the fortunate position of holding considerable stocks of material in connection with the various classes of work they undertake, and that they have advised the President of the Local Government Board that they are willing to supply to local authorities and others carrying out distress or relief works during the war their Lithomac asphalt paving and Lithofalt paving blocks at current market prices. The Lithofalt paving blocks in particular should appeal to engineers who are required to prepare schemes for relief work. These paving blocks, which, we understand, are at present being laid by the direct employment of labour by the boroughs of Hampstead, Poplar, Warrington, Rochdale among others, are designed to meet the wants of those local authorities who are obliged to find work for the unemployed. The whole of the work in connection with the preparation of the necessary concrete foundation and the laying of the Lithofalt blocks can be carried out under the supervision of the borough authorities by the direct employment of local labour. We believe we are correct in saying that the directors of the Limmer Asphalt Paving Company, Limited, have not discharged a single workman on account of the war, and have afforded facilities for the members of their staff to enlist, either in the Regular Army or in the Territorials. They have also arranged to keep open the places of all men who enlist.

LOCAL AUTHORITIES AND THE WAR.

Brentford Urban District Council have agreed to allow full pay to all their men on service.

All the lending libraries of Camberwell have had to be shut, as the staffs have volunteered for active service.

The military authorities have purchased six water carts and fifteen horses from the Deptford Borough Council for £1,470.

The staff of the Wood Green Urban District Council have unanimously decided to give a percentage of their salaries to the Prince of Wales' Relief Fund.

Twickenham Urban District Council employees have made from their wages their second weekly contribution, amounting to £3 19s. 2d., to the local Relief Fund.

Chislehurst Urban District Council will pay employees such a sum as, with the Government pay, will make up full salary or wages, and afterwards reinstate the men in their positions.

Manchester Corporation Gas Committee have voted £10,000 from surplus profits—£7,000 towards the Manchester Battalion which is being formed, and £3,000 towards the Lord Mayor's local fund, which now totals £10,000.

Antrim County Council have appointed a committee with full council powers to prepare and carry into execution schemes for the employment or otherwise for the relief of distress arising from the outbreak of hostilities.

A large machinery order given by Bradford Corporation Electricity Committee some time ago to a German firm was on Tuesday cancelled and transferred to the British Westinghouse Electric Company, Manchester.

Nineteen employees of the Worcester Corporation have been called to the colours. It has been decided to pay full salary or wages for a month, and to draw up a scheme of future allowances for submission to the next meeting of the council.

Esher and the Dittons Urban District Council have decided to keep open the situations of employees who have joined the Forces, and to continue to pay their wages during absence. Seven have already joined, and half-a-dozen more are expected to leave shortly.

The East Barnet Valley Urban District Council have resolved that the positions of volunteers shall be kept open, and that the difference between what was paid the men by the Government and what was paid by the council shall be made up by the council.

Gainsborough Urban District Council have instructed the surveyor, Mr. S. W. Parker, to make arrangements to set to work totally unemployed men three or four days a week, and have invited unemployed men to give their names to the surveyor.

The Blaenavon Urban District Council have resolved to pay the surveyor, Mr. E. W. Edwards, a month's salary while serving with the colours pending information regarding the rates of pay, and also to pay unmarried men on military service 5s. a week.

Manchester Corporation on Wednesday last passed a resolution that no employee who volunteers for active service in the Army or Navy shall be in a worse monetary position by reason of his enlistment than he is at present, and that an assurance shall be given him that his place will be kept open for him.

Cape Town Council have decided to make a grant to the dependents of corporation employees on active service at the rate of 5s. in the case of a wife and 2s. for each child during the time such servants are away. This is exclusive of the Government allowance of 7s. 7d. for each wife and 1s. 2d. per child.

Sixty-five servants of the Blackburn Corporation and twenty-five members of the borough police force have been called upon by the military authorities, and the question of making allowances to families and dependents has been referred to the General Purposes Sub-committee. The various committees have been instructed to bring forward their programmes of public works, so that, in case of acute distress, employment could be provided.

All employees of the Edinburgh Corporation called up for service will be allowed the difference between the wages they receive from the corporation and their allowance from the Army or Navy. The number called up is, approximately, 200. The question was raised as to the position of such city employees who, being neither Reservists nor Territorials, enlisted at the present time, and it was agreed that they should be put on a similar footing to the others.

The Improved Wood Pavement Company, Limited, 46 Queen Victoria-street, E.C., give notice that after Monday, September 7th, no unmarried workmen who are eligible for the army will be retained in the employment of the firm unless they are the main supports of relatives or other dependents, or unless they are skilled workmen whose services are necessary for the benefit of unskilled men. Berths of all regular workmen will be kept open.

Modern Bituminous Surfaces and Bituminous Pavements.*

By ARTHUR H. BLANCHARD, M.CAN.SOC.C.E., Professor of Highway Engineering, Columbia University

Although bituminous pavements have been in use in American cities pavilions for nearly fifty years, the introduction of modern bituminous pavements, i.e., the construction of bituminous surfaces on broken stone or on compositions of broken stone and gravel, began in America during the year about 1906. This point is well illustrated by the fact that in 1905 the total mileage of bituminous surfaces and bituminous pavements constructed under the direction of the county or state highway departments in the eastern part of the United States was only 416,700. Since that period the growth of the use of bituminous materials in the construction and maintenance of roads and pavements has been exceedingly rapid.

In order to avoid misunderstandings, the various methods of using bituminous materials referred to in this paper will be explained by the following definitions.

Bituminous surfaces are those consisting of superficial coats of bituminous materials with or without the addition of stone or slag chips, gravel, sand, or cinders of a similar character.

Bituminous macadam pavements are those consisting of broken stone and bituminous materials incorporated together by penetration methods.

Bituminous gravel pavements are those consisting of gravel and bituminous materials incorporated together by penetration methods.

Bituminous concrete pavements are those having a wearing surface composed of stone, gravel, sand, &c., or combinations thereof, and bituminous materials incorporated together by mixing methods.

The definitions of bituminous surfaces and bituminous concrete pavements quoted above have been advocated for adoption in the reports of the Special Committee on "Bituminous Materials for Road Construction and Standards for their Test and Use" of the American Society of Civil Engineers, whereas the fundamentals of the above definition of bituminous macadam pavements are embodied in the following quotation from the 1915 report of the Association for Standardising Paving Specifications: "If the stone is spread in place, and the bituminous cement or binder applied afterwards, the resulting product is bituminous macadam." As sheet asphalt pavements have been in use for many years, and as the essentials of good construction have been well established, this type of bituminous pavement will not be dealt with in this paper.

BITUMINOUS SURFACES.

Since the formulation of the fundamental principles of the successful construction of tar surfaces by the engineers of the Department of Roads and Bridges of France in 1903, bituminous surfaces have been used extensively in Europe. As an illustration might be cited the construction of 5,000,000 sq. yds. of tar surfaces in one county of England in 1911, under the supervision of the county surveyor of Kent, Mr. H. P. Maybury, M.INST.C.E. During the past eight years American engineers have used bituminous materials in this method of construction and maintenance of roads and pavements.

In the case of broken stone and gravel roads, the most efficient method of procedure is to thoroughly clean the surface by sweeping with hand brooms or horse sweepers and hand brooms, the final sweeping being done with bass or other fine-fibre brooms. The bituminous material, which is generally heated, is applied to the surface in amounts varying from one-quarter to one-half gallon per square yard with the aid of pouring cans, hose attached to tanks, hand-drawn gravity distributors, horse-drawn or motor-truck gravity, or pressure distributors. Some kind of mineral coating is generally applied to cover the bituminous material. The degree of cleanliness of the surface obtained by sweeping will depend to a large extent upon the details of the original construction. It has been found that a road with a thoroughly rolled and well puddled broken stone wearing surface composed of stone passing from 1 in. to 2½ in. in longest dimension may be easily treated, and the essential adhesion of the bituminous surface readily secured. This method is characteristic of the modern practice of some of the foremost English and French engineers.

Considerable development has taken place in the use of different kinds of bituminous materials. Tars, both of the water-gas and coal-gas types, continue to be used to a large extent. Without doubt the most comprehensive specifications for the construction of bituminous surfaces with tar are those adopted by the Road Board of England. There has been noted a growing objection to the use of certain asphaltic oils, which require from two to three weeks to "set up" to such an extent that tracking will not occur.

BITUMINOUS MACADAM AND BITUMINOUS GRAVEL PAVEMENTS.

Bituminous macadam and bituminous gravel pavements are of many types, one of the primary differences in construction being the use of one or two applications of the bituminous material. The efficacy of many of the types depends upon the combinations of sizes of broken stone or gravel and the combinations of bituminous materials used when two applications are employed. Variations in types also exist dependent upon the manner in which the different courses may be filled and the treatment of the filled course prior to the application of the bituminous material. The one application method is very similar in its simplest form to the construction of a bituminous surface, except that the bituminous material is applied upon a much more open surface. In the case of the two-application method, in certain instances an attempt is made to build up a two-course pavement, while in others the second application is in reality used as a seal coat.

Two of the main difficulties in the construction of bituminous macadam pavements have been to secure a thoroughly compacted wearing course of non-segregated broken stone and the uniform application of the bituminous cement so that the broken stones of the wearing surface would be uniformly bound together. In connection with the above statement should be noted the following excerpt from the 1914 report of the Special Committee of the American Society of Civil Engineers:—

"An important factor for successful results (in the construction of bituminous pavements by the penetration method) is the thorough compaction by rolling of the road metal before the spreading of the bituminous material."

Two methods which have given satisfactory results will be cited as examples of modern practice.

When the metalling in the wearing course consists of a naturally graded aggregate ranging in sizes from ½ in. to 1½ in., it has been found unnecessary to further fill the voids by the application of a finer product before the first application of the bituminous material. The character of the product referred to above is shown by the following mechanical analysis:—

Percentage passing	½-in. screen ...	18·9
,, ,,	¼-in. ,,	43·1
,, ,,	1-in. ,,	34·4
,, ,,	1¼-in. ,, ...	3·6
		100·0

After the wearing course has been thoroughly rolled, from 1¼ to 1¾ gallons to the square yard of bituminous material is uniformly distributed. Stone chips, free from dust, are then distributed to fill the surface voids. After the chips are rolled, a seal coat of ½ to 1 gallon per square yard of bituminous material is applied. The pavement is finished by the rolling of a second application of stone chips.

As the second method will be described what the speaker considers the most satisfactory type of bituminous macadam pavement at present constructed in England. The bituminous pavement referred to is known by the name of "Pitchmac," and was designed by the city engineer of Liverpool, John A. Brodie, M.INST.C.E. The following description of the standard method employed in Liverpool is given by Mr. Brodie:

"Pitch-grouted macadam has been found to give

* Paper presented to the Canadian and International Good Roads Congress at Montreal.

most satisfactory results in streets of medium and light traffic, and is now being largely used in place of ordinary macadam, but also of more expensive pavements. It is laid to a depth of from 3½ in. to 4½ in., in two layers. Water gravel or macadam is used, screen to a 2½-in. gauge for the lower layer, and to 1-in. for the top surface. Each layer is put down by mechanical spreaders, rolled twice, and after the grouting of joints and sand mixture has been applied over the surface is thoroughly consolidated. The foundation is generally of hard-pitched rock, 10 in. deep, as for ordinary macadam, but in some cases a bed of [illegible] has been used on main roads. Patch [illegible] being also used as a surface covering for old boulder pavements, many of which still exist in Liverpool, in side streets where the traffic is very slight. The cost of such macadam may be taken at 1s. (24 cents) per square yard per inch of depth."

BITUMINOUS CONCRETE PAVEMENTS

Bituminous concrete pavements other than sheet asphalt and pavements laid by companies as proprietary articles have received more attention during the past three years than at any time since the days of Abbot, Leverich, Scrimshaw, and Van Camp. Less fear of litigation proceedings and the introduction of economical mixing machines equipped with heating attachments have exerted a marked influence, but, furthermore, the rapidly growing recognition of the inherent advantages of bituminous pavements constructed by the mixing method has been largely instrumental in its adoption for traffic conditions for which it is believed to be economical and suitable. Bituminous concrete pavements, in which broken stone forms an integral part of the mineral aggregate, may be divided into three classes.

It is self-evident that the simplest type is one having a mineral aggregate composed of one product of a crusher, that is, similar to the product in the usual type of portable crushing and screening plant, which passes over one screen and through the larger holes of the adjacent screen. This broken stone, in certain cases, may be somewhat uniform in size, but usually such is not the case. In the speaker's opinion, an essential element in the construction of this type of bituminous concrete pavement consists in using a product of a crusher which will have a range from 1 in. to 1½ in. in its sizes. As an illustration will be cited a mechanical analysis of a product which was obtained from a plant where the broken stone passed over a ½-in. screen and through a 1½-in. screen:—

Percentage passing	⅛-in. screen	...	1·2
,, ,,	¼-in. ,,		4·2
,, ,,	½-in. ,,	... ...	34·7
,, ,,	¾-in. ,,	...	40·6
,, ,,	1-in. ,,	... ...	17·3
,, ,,	1½-in. ,,	... ...	2·0
			100·0

It is apparent that the above product would not be referred to as composed of uniform-sized stone. It is of interest to note that certain bituminous concrete pavements, having a width of 25 ft., constructed with this product of broken stone in 1911 have been subjected to an average daily mixed traffic of 2,000 to 3,000 vehicles, and are at present in excellent condition with no maintenance charges to date.

This type of bituminous concrete pavement has been constructed for many years by using either one or, in certain cases, several courses of broken stone mixed with bituminous cement. As an illustration of the latter method will be cited the practice of one large construction company which builds this type of pavement. The first or bottom course of metal coated with bituminous cement ranges from 1½ in. to 2½ in., the second course from ½ in. to 1½ in., and the third course from ¼ in. to ½ in. The pavement is finished with a dressing of uncoated chips.

Asphalts, tars and tar-asphalt compounds have been used for the bituminous cement. In some cases one kind of bituminous material has been used in the mix and another kind for the seal coat; one of the most common combinations being the use of tar in the mix and asphalt for the seal coat.

As illustrative of some of the details of construction of this type of bituminous concrete pavement which should be covered in contracts, excerpts from specifications recently drafted by Mr. Prevost Hubbard and the speaker for the New York State Department of Efficiency and Economy will be cited. It should be borne in mind that the temperatures and other limitations specified apply to the bituminous cements and mineral aggregate covered in other sections of the specifications.

"Broken stone for the bituminous concrete shall be heated as directed, before entering the mixer, to between 66 deg. Cent. (150 deg. Fahr.) and 149 deg. Cent. (300 deg. Fahr.) in revolving dryers in which no flame shall be permitted to come in contact with the broken stone, and in which the broken stone shall be continuously agitated during the heating.

"The asphalt cement or refined tar shall be heated in kettles so designed as to admit of even heating of the entire mass, with an efficient and positive control of the heat at all times. Asphalt cement shall be heated as directed to a temperature between 135 deg. Cent. (275 deg. Fahr.) and 177 deg. Cent. (350 deg. Fahr.). All asphalt cement heated beyond 177 deg. Cent. (350 deg. Fahr.), either before or during mixing with the broken stone, shall be rejected. Refined tar shall be heated as directed to a temperature between 93 deg. Cent. (200 deg. Fahr.) and 135 deg. Cent. (275 deg. Fahr.). All tar heated beyond 135 deg. Cent. (275 deg. Fahr.), either before or during mixing with the broken stone, shall be rejected.

"When thoroughly heated to the temperature directed, the asphalt cement or refined tar and the broken stone for the bituminous concrete shall be mixed so that the resulting mixture shall contain between 5 and 7½ per cent by weight of bitumen as directed. A mixer shall be used, having revolving blades, and so designed and operated as to produce and discharge a thoroughly coated and uniform mixture of non-segregated broken stone and asphalt cement. When discharged, mixtures of asphalt cement and broken stone shall have a temperature not more than 149 deg. Cent. (300 deg. Fahr.) and not less than 93 deg. Cent. (200 deg. Fahr.) as directed. When discharged, mixtures of refined tar and broken stone shall have a temperature not more than 121 deg. Cent. (250 deg. Fahr.) and not less than 66 deg. Cent. (150 deg. Fahr.), as directed.

"The bituminous concrete, heated and prepared as specified, shall be delivered direct from the mixer to the point of deposition on the foundation in trucks or wagons provided with canvas covers for retaining the heat. As delivered the bituminous concrete shall have a temperature of at least 66 deg. Cent. (150 deg. Fahr.). Material having a lower temperature than this shall not be laid upon the foundation.

"Rollers used on the bituminous concrete and the seal coat shall be well balanced, self-propelled, tandem rollers, weighing between 10 and 12 tons each. Each shall have a compression under the rear roller of between 200 and 350 lb. per linear inch of roll, and shall be provided with an ashpan, which shall prevent ashes from dropping on to the bituminous concrete or seal coat.

"As soon as possible after the compaction of the bituminous concrete, when the surface is clean and dry, a seal coat of the hot asphalt cement shall be evenly distributed over the bituminous concrete, and spread by means of squeegees as directed. The asphalt cement shall be applied at a temperature not less than 135 deg. Cent. (275 deg. Fahr.), nor more than 177 deg. Cent. (350 deg. Fahr.), at a rate of ½ to 1 gallon per square yard, as directed. A thin, uniform layer of dry, clean No. 1 broken stone (stone chips) shall be immediately spread over the asphalt cement, as directed, by machines or skilled workmen. The spreading of the No. 1 broken stone shall not lag more than 20 ft. behind the placing of the asphalt cement coating. No. 1 broken stone shall not be placed on the wearing course before the asphalt cement of the seal coat is applied. The surface of the bituminous concrete shall be kept scrupulously clean until the seal coat is applied, and the contractor shall not permit any hauling over the wearing course before the completion of the seal coat.

"No bituminous concrete shall be mixed or placed between October 1st and May 15th except by written permission, and no bituminous concrete shall be mixed or placed when the air temperature in the shade is below 10 deg. Cent. (50 deg. Fahr.), or when the foundation is damp or otherwise unsatisfactory."

The second type usually consists of the broken stone composing one product of a crusher and sand or other fine mineral matter mixed together with a bituminous cement. The wearing surface of this mix is sometimes finished by rolling in fine stone chips, but generally a seal coat is used, together with fine mineral matter for a top dressing. When constructed on a commercial scale, the mineral aggregate is

[illegible]

[illegible]

In the third type of [illegible] pavement [illegible] specifications. As an example [illegible] the following [illegible] concerning the composition of the mineral aggregate of Warrenite, a proprietary pavement of the Warren Brothers Company [illegible] by Mr William H. Connell, chief of the bureau of highways, in [illegible] of Philadelphia:—

"Material passing 1½-in. screen and retained on No. [illegible] per cent. Material passing No. [illegible] and retained on No. [illegible], 10 to 20 per cent. Material passing No. 4 sieve and retained on No. 10 [illegible] per cent. Material passing No. 10 sieve and retained on No. 30 sieve, 10 to 5 per cent. Material passing No. 80 sieve, at least 25 per cent of [illegible] will pass a No. 200 sieve, 10 to 5 per cent. The balance to pass No. 30 sieve and be retained on No. 80 sieve."

In 1914 [illegible] of the State of New Jersey [illegible] the following specifications of the grading of a bituminous concrete pavement similar to the one [illegible]:—

Sieve Size	Percentages. Minimum.	Maximum
Passing 1½-in. and retained on 1-in.	0	15
" 1-in. " ½-in.	40	50
" ½-in. " ¼-in.	10	25
" ¼-in. " 10-mesh	8	15
" 10-mesh " 30-mesh	12	22
" 30-mesh " 80-mesh	5	15
" 80-mesh " 200-mesh	3	8
" 200-mesh sieve	2	8
Bitumen content	6.5	8.5

As another illustration might be cited, the well-[illegible] grading of a mixture of broken stone and sand. The [illegible] grading is as follows:—

Percentage of bitumen	from 7 to 11
mineral aggregate passing 20-mesh screen	7 to 11
mineral aggregate passing 10-mesh screen	18 to 20
mineral aggregate passing 10-mesh screen	25 to 35
mineral aggregate passing ½-mesh screen	8 to 22
mineral aggregate passing 2-mesh screen	less than 10

In the construction of all types of bituminous concrete pavements, in addition to the requirements covering the properties of the bituminous cement and the quality and character of the mineral aggregate, certain essential features should be given careful consideration. The following citations from the 1914 report of the Special Committee of the American Society of Civil Engineers are especially pertinent:—

"Where the character of the traffic justifies the use of a bituminous concrete pavement, the same conditions demand an extraordinarily strong foundation therefor.

"The amount of bituminous material to be used in any case will depend upon the peculiar conditions of that case, such as the kind of road metal and of bituminous material, the character of the aggregate, the climatic conditions, &c.

"The character of the mineral aggregate to be used may be controlled by local conditions, but the best results can only be obtained by the use of the best materials. Excessive sizes, or excessive variations in the size of the mineral particles, should be avoided, and the utmost care must be taken to avoid the segregation of the different size particles.

"Mixing machines should be used, and hand-mixing methods should be avoided wherever practicable.

"In the use of a heated aggregate for the construction of a bituminous concrete pavement, non-uniformity or excess in the heating of stone should be avoided.

"Where bituminous pavements are laid, the edges should be protected and a sudden transition from the pavement to any softer shoulder material avoided by means of cement concrete or other edgings, and such reinforcement of the shoulder material as may be necessary."

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.

— Massinger: "The Fatal Dowry," Act ii, 2

CLOSSARY OF ROAD TERMS.

To the Editor of The Surveyor.

Sir, I have read with considerable interest the review in your last issue of my "Glossary of Road Terms," which is exactly the description of criticism necessary to make the book useful.

In the first work of the kind that has ever been published it was naturally extremely difficult to decide what words to include and what to exclude. My only guide was to read books, lectures and discussions on the road question, and observe all the technical words that were used by the writers and speakers, and from my knowledge of the subject—gained over a very long period of experience—to add such words as I felt might be useful.

My next object was to give very short definitions where the words were fairly obvious, and to extend those definitions for words which were somewhat in dispute. I agree with your criticisms that my definitions of the words "pan," "pavement," "scarify," "drag," are short, but to extend them would, perhaps, have been unnecessary. If your reviewer could kindly, in reply to this letter, suggest better and more comprehensive definitions, I would gladly consider them in another edition.

With regard to the word "crust," I cannot agree with your reviewer. The word "crust" cannot, I think, be intended to refer to the whole thickness of road formation, but only to the surface crust and the strength crust; the bottoming, or foundation, cannot, I think, be termed a "crust." However, I quite agree that this new word "crust" requires further elucidation, and further correspondence on this subject would be very useful in the columns of your paper. As to my inadequate definitions of "depot," "aqueduct," "invert," "lagging," and "derrick"—I quite agree as to "depot"—the definition is too brief. "Aqueduct" might have been omitted altogether, as it is a rather remote road term. As to "invert," I should be glad of a better definition, but I took mine from that excellent work "The Imperial Dictionary of the English Language," and it is the best I could find. "Lagging" is, I agree, a difficult word to define; but I think mine sufficiently covers the two meanings of the word. Here again I should be glad of better definitions if not too lengthy. As to "derrick" referring to boom and stays, neither of which latter words are defined, I think your reviewer is a little hypercritical, as to define words used in definitions which are apparently obvious would naturally unduly expand the book. His criticism is, however, worthy of consideration. With regard to geological terms having been left out altogether, your reviewer has discovered a weak spot. I commenced to deal with these, but found the work of compilation so difficult and extended that I fell back on the definitions settled by the Engineering Standards Committee as being "the line of least resistance."

With regard to the anomaly of the use of the expression "trade name" as applied to proprietary manufactured articles and to natural rocks, here again I must plead guilty to having followed the definitions given by the Engineering Standards Committee. Your reviewer will find that, under the words "schist" and "shale," I say "the trade name of a group of road-making rocks," in which I followed scrupulously the exact words used in the definitions given by that committee. As to topographical terms being further extended to include "glen," "dale," "spur" and "pass," it might be well to include them hereafter, but it is very difficult to draw the line between those which are useful and those which are not. My impression is that I only included those topographical terms which I had found had been used by writers or speakers when discussing road questions.

As to the omission of certain words relating to law and administration, the same remarks or "excuses" apply.

With regard to the numerous other criticisms of your reviewer, I agree with some of them, but not all. Space will not permit me to refer to them individually, but with regard to his question as to why if I included "immerse" I did not include "swim," it is obvious that the word "immerse" is frequently used in connection with road making, whereas I have never yet discovered the word "swim" used in connection therewith. The latter part of your

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reviewer's criticisms, which are in the nature of corrections, I shall certainly look into carefully; they seem to be quite right.

In conclusion, may I be permitted to thank your reviewer very heartily for his excellent review, and for his exceedingly able and well-thought-out criticisms? The "Glossary" was much more difficult to compile, and took much more time, than I anticipated when I commenced the task, but my object was, if possible, to assist surveyors and others who have, I regret to say, been hitherto somewhat lax in their use of terms as applied to road construction and maintenance. I should be only too glad if every surveyor in the country would read my "Glossary," digest it as your reviewer has done, and criticise and find fault with it as much as he pleases. It is only by ventilating and discussing subjects that something like the truth eventually emerges.—Yours, &c.,

H. Percy Boulnois, M.Inst.C.E.

7 Victoria-street,
Westminster, S.W.

RURAL LABOURERS' COTTAGES.

To the Editor of The Surveyor

Sir, Will you allow me to thank you for your editorial comments on the rural cottage designs illustrated in your issue of the 28th ult., and at the same time permit me to remark that the estimate of £150 is based on a rate of 5d. per foot cube (measured from 1 ft. below ground level) as against the 4½d. rate quoted by you?

The rate of 5d. was adopted as a fair average for cottage work on the ordinary lines, but this rate will differ according to locality, ranging as low as 3¾d. per foot and as high as 6d. Whatever the rate may be in a given district, and to a given specification, it is clear that the very great savings to be effected in the quadruple form of construction as compared with the usual types will represent a reduction in cost of seldom less than ¾d. to the foot.

If economical considerations insist on a cutting down of the scale of accommodation, there is no difficulty in getting the cost within the neighbourhood of £100, while at the same time retaining the advantages of the internal planning and the external architectural effect.—Yours, &c.,

C. L. Fielder.

"Kingsmead," Latchmere-road,
Kingston-on-Thames.
September 1, 1914.

"QUENAST."

To the Editor of The Surveyor.

Sir,—At this time, when the hearts of Englishmen go out to plucky little Belgium, the thoughts of many surveyors turn to the great Quenast quarry, well known to most of the visitors to the Brussels Road Congress of 1910, and as so many of our friends are asking for news of Quenast, we should be very grateful if we might make use of your columns.

At Quenast the majority of the workmen were called to the colours; the quarry manager took up his duties as an officer of garrison artillery in one of the forts at Namur, while the managing director, Mr. Hankar Urban, as mayor, has no doubt had to be responsible to the Germans for law and order in the village.

The big battle recently fought at Mons would have taken place on the doorstep of the quarry, being on the lines of the German base.

Since this battle was fought we have had no news, and fear we shall hear nothing for some months.

We are making arrangements for carrying out our contracts in other materials if possible, and under the terribly trying circumstances we feel sure we shall have the sympathy and help of our many Surveyor friends and customers.—Yours, &c.,

The London Granite Company, Ltd.
(H. L. Wettern, Director.)

16 Water-lane, E.C.
August 31, 1914.

PRO PATRIA.

In The Surveyor of August 21st, in the column of "Things One Would Like to Know," it was asked if it would not be possible to compile an "Honours" list of municipal, engineering and sanitary officials who are taking an active part in the great war. With a view to carrying out the suggestion we publish below such information as has come to hand, and should be obliged if readers would assist us by notifying us of other cases within their knowledge.

Ashurst, J., city surveyor, St. Albans.

Ayre, C. A., third assistant engineer to the Watford Urban District Council, has received notice to hold himself in readiness for the Special Reserve.

Barker, E. A., electrical engineer, Barnsley Corporation.

Bell, Leonard, sanitary inspector, Westhampnett Rural District Council, Lieutenant and Transport Officer attached to the Eastern Mounted Brigade of Field Ambulance (Territorials).

Blake, Leslie, assistant surveyor to the Wincanton Rural District Council.

Edwards, E. W., surveyor to the Blaenavon Urban District Council.

Gladwell, C. W., assistant surveyor to the Eton Rural District Council, attached to South Midland Brigade Army Service Corps. Mr. Gladwell has volunteered for foreign service.

Hooley, E. P., M.Inst.C.E., county surveyor of Nottinghamshire, with the 8th Battalion of the Sherwood Foresters.

Jenner, ——, inspector of nuisances to the Battle Rural District Council.

Middleton, ——, inspector of nuisances to the Charlton Kings Urban District Council.

Shaw, David Honeyman, assistant district master of works, Dunfermline District, Fife County Council, sergeant, Highland (Fife) Royal Garrison Artillery (Territorials). Volunteered for foreign service.

Smale, W. L. B., surveyor for the Northern District under the Liskeard Rural District Council, 4th Battalion of the Devon Regiment.

Tebbitt, H. S., surveyor and inspector to the Tutbury (Staffs) Rural District Council, a member of the Legion of Frontiersmen.

In addition to the "Honours" list of municipal engineering and sanitary officials who are taking part in the great war, we think it will interest our readers if we also publish the names of those in the commercial world who are giving their services, and we have great pleasure in recording the following names of the "commercique" list:—

Beadle, Herbert, managing director of British Macadams Company and Road Maintenance Company, Limited, second lieutenant in the 4th Home Counties Howitzer Brigade.

Cooper, H. L., director of Cooper, Wettern & Co. and H. L. Cooper & Co., Limited, colonel commanding Transport Column A.S.C., Wessex Division.

We understand that both these gentlemen, who are well known to municipal and county engineers, have volunteered for foreign service. There are, doubtless, many other names which could be added to this list, and we shall be grateful for any assistance that can be rendered us in making it complete.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

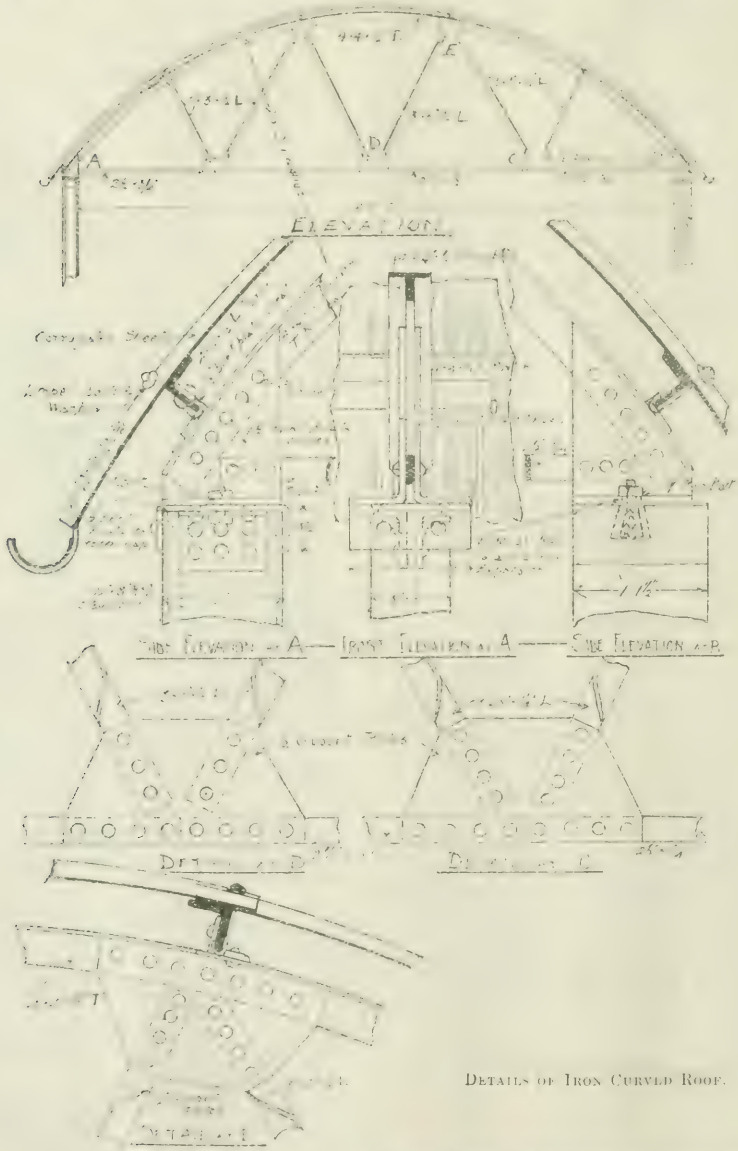
All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration, and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for August was awarded to

Mr. J. A. Robinson,
72 Newington,
Edinburgh.

Whose contributions have appeared in the pages of the journal during the month.



Details of Iron Curved Roof.

QUESTIONS.

This week answers are invited to the following questions.

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. X. (Leeds.)

421. Reactions of Beams. Show how to find graphically or otherwise the pressures on the two supports of a horizontal beam which is loaded at any given point.

422. Building Construction. The earth in front of a semi-basement to a house has to be supported for a depth of 6 ft. Give a section of a suitable retaining wall, and prove its stability by a graphic diagram.

423. Sewer Construction.—Show by sketches (plan

and section the junction of a 3-ft. and a 5-ft. brick barrel sewer.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

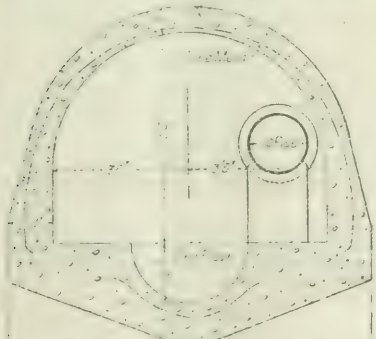
418. Iron Curved Roof. Show details of an iron curved roof of 40 ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G. F., *Bedford*.)

A general elevation of the truss is given. In this type of truss it will be found that all the internal members of the truss will be liable to a compressive stress, as the wind acts on one side or the other. There will be no difference at the foot of the principal rafter as in the truss itself, both shoes being formed of ½-in. plate bent to shape, being fixed on the brick wall side to a stone template by 1-in. rag bolts, and on the stanchion side by means of 1-in. bolts passing through the cap and angle piece. The cap is formed of bent plate riveted to the stanchion by means of bent plate cleats. If the bottom ends of the stanchions are securely fastened into the ground there will be no need for girders at the top of the stanchions, unless the stanchions are more than 10-ft. centres, the purlins stiffening the structure sufficiently. (J. A. R., *Faversham*.)

WATER MAIN IN SEWER.

By Stuart Howard,
Sewer Department, Montreal.

The accompanying illustration shows a concrete sewer so constructed that the main water pipes can be placed in it on standards. The storm water, which is admitted from portions of the city on the combined system, does not rise very high in the sewer, the



greater portion of the area served by this sewer being on the separate system.

The manholes are so constructed that the water pipes can be lowered into the sewer and placed on the standards. At the ground surface the manhole opening is 2 ft. by 2 ft. 6 in., and at the crown of the sewer they are elongated, so that the water pipes can be lowered at an angle to clear the walls. From *Engineering Record*.

Hunslet Town Planning Scheme.—The town planning scheme of the Hunslet Rural District Council has now arrived at the end of its first stage, plans and proposals having been deposited at the offices of the council for inspection. The council propose to restrict the number of houses to be built in one part of the area to eight per acre, and in another part to fourteen per acre; while the greatest number which may be arranged for in other parts is twenty per acre.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Birmingham, Tame and Rea District Drainage Board (August 26th. Mr. [illegible]) [illegible] Mr. W. [illegible] stated that the proposed site was altogether unsuitable, and the transfer to [illegible] at Aston [illegible].

Birmingham T.C. (August 26th. Mr. F. C. Ekins). [illegible] Mr. F. E. [illegible] stated that the scheme was required owing to the development of building estates in the district. Should any houses be built on some portions of the estates they would be [illegible].

Colchester T.C. (August 24th. Mr. F. H. Tulloch).—£8,325 for wood paving in Crouch-street, Head-street, High-street, Hythe-hill, Hythe-quay, and Hythe Station-road. It was explained that the work of wood paving the streets named was being carried out in conjunction with a scheme inaugurated by the town council, the county council and the Road Board, and that, although the town council were asking for a loan of £8,325, the sum of £5,000 would be received from the county council for the purpose of carrying on the work.

Lowestoft T.C. (September 1st. Mr. A. W. Brightmore).—£11,120 for works of sewerage, including the execution of works in the urban district of Oulton Broad and the parish of Oulton.—The town clerk, Mr. R. B. Nicholson, stated that the loan indebtedness for sewerage purposes was £11,016. The proposed works had been delayed through a scheme between the town council and the Oulton Broad Urban District Council falling through. The work had been expedited in order to provide employment for those who might lose their work through the war. The borough surveyor, Mr. G. H. Hamby, explained the plans, and said the pumping stations would be underground.

Neath R.D.C. (August 27th. Mr. H. Shelford Bidgood). [illegible] flushing purposes.—It was stated by the surveyor, Mr. W. E. C. Thomas, that [illegible] dealt with by a tank which emptied into the river.

Newport (Mon.) T.C. (August 18th. Mr. W. M. Cross).—£10,321 for the construction of a main sewer and outfall works.—The town clerk, Mr. A. A. Newman, said the council asked for a period of thirty years for repayment. The works were being constructed by agreement with the British Mannesmann Tube Company, who were proposing to erect large works.

Rhondda U.D.C. (August 28th. Mr. H. Shelford Bidgood). [illegible] £17,000 [illegible] works in the urban district of Pontypridd.—Mr. W. P. Nicholas, clerk of the council, stated that the works were to be erected at Trehafod in substitution of old works which had been damaged by mining operations and subsidence. The application was supported by Mr. W. E. Lowe, surveyor to the Pontypridd Council, who said they had suffered in the past by the pollution of the river. Plans of the scheme were submitted by Mr. E. H. Barber, surveyor, and Mr. E. Taylor, deputy surveyor.

Stoke-on-Trent T.C. (August 12th. Mr. R. G. Hetherington).—£3,122 in respect of alterations to Longton Town Hall, [illegible] £1,050 for the [illegible] in Cromer-road, Hanley, for the purposes of a refuse destructor, and £11,113 for [illegible] of paving and surface-water drainage in Waterloo-road, Wedgwood-street, and Scotia-road, Burslem.—The necessary information was given by the officials, including the assistant borough surveyor, Mr. J. R. Heath. The inspector called attention to the fact that the building extras at Longton Town Hall amounted to £1,945, the greater portion of which had gone in a scheme of decoration not sanctioned by the board. He thought that some of this work ought to have been provided for in the original estimates. Some of the extras [illegible]

[illegible]

Thakenham R.D.C. (August 26th. Mr. R. G. [illegible]) £172 for the [illegible] in the parish of [illegible] Mr. W. W. [illegible]

Torquay T.C. (August 27th. Mr. W. O. E. Meade-King [illegible] a portion of the highway, substituting a 30-ft. road. The town council wished to make Wheatridge-lane 36 ft. wide, and the railway company had arranged [illegible] 12 ft. wide. The Great Western Railway Company had [illegible] The town council wished to make Wheatridge-lane 36 ft. wide, and the railway company had arranged [illegible]

APPLICATIONS FOR LOANS.

Chapel-en-le-Frith R.D.C.—£700 for the completion of the new reservoir.

Chesterton R.D.C.—£770 for workmen's dwellings.

Chorley T.C.—£3,250 for a new street, and £650 for shelters, swings, and a caretaker's hut at the recreation ground.

Colne T.C.—£480 for road improvement.

Foleshill R.D.C.—£14,250 for a housing scheme.

Loughborough T.C.—£500 for street paving works.

Lowestoft T.C.—£10,900 for resurfacing, and £2,200 for kerbing and channelling.

Macclesfield T.C.—£3,300 for alterations to school buildings.

Neath R.D.C.—£100 for water mains extension, and £500 for road widening.

Newport (Mon.) T.C.—£16,070 for works at the South Cliff Gardens.

Petersfield R.D.C.—£8,750 for works of sewerage.

Wem U.D.C.—£1,000 for the erection of cottages.

Wigan T.C.—£3,726 for alterations and extensions to the baths.

Wrexham T.C.—£1,660 for the purchase of land for a housing scheme.

LOANS SANCTIONED.

Aberystwyth T.C.—£2,610 for workmen's dwellings.

Hastings T.C.—£16,000, revised estimate for the Hastings Pier shore end improvement.

Hebden Bridge U.D.C.—£1,200 for the purpose of the electricity undertaking, and £3,900 for street improvement.

Heckmondwike U.D.C.—£4,780 for works of paving.

Holmfirth U.D.C.—£2,360 for works of sewerage.

Kendal T.C.—£571 for works of road improvement.

Lismore R.D.C.—£3,000, supplemental loan for the improvement scheme.

Llandudno U.D.C.—£13,195 for the provision of golf links, and £4,855 for a housing scheme.

Lymington T.C.—£1,845 for a scheme of sewerage.

Maidstone T.C.—£320 for main sewer extension.

Manchester T.C.—£7,567 for private street improvement works.

Runcorn R.D.C.—£405 for works of water supply, and £705 for street works.

Sittingbourne and Milton Joint Hospital Board.—£3,320 for building extensions.

FORTHCOMING INQUIRIES.

SEPTEMBER.

		£
7.—	**Wealdstone.** For the extension of the council offices (Mr. F. H. Tulloch) ...	2,500
8.—	**Abercorn.** For the provision of a recreation ground (Mr. A. G. Drury)... ...	1,376
8.—	**Basingstoke.** For the erection of dwellings (Mr. Courtenay Clifton)	550
8.—	**Cleckheaton.** For the purpose of electricity (Mr. F. O. Stanford)	2,200
8.—	**Grimsby.** For the provision of public walks (Mr. Edgar Dudley)	4,620
8.—	**Marsden.** For works of sewage disposal (Major C. E. Norton)	7,384
8.—	**Wakefield.** For works of sewerage (Mr. W. O. E. Meade-King)	1,300
8.—	**Waltham Abbey.** For street improvement (Mr. A. W. Brightmore)	2,651
8.—	**Torquay.** For the purposes of electricity and the provision of a pavilion (Mr. H. Shelford Bidwell)	22,490
9.—	**Batley.** For work of culverting (Mr. W. O. E. Meade-King)	2,400
9.—	**Bromley.** For street works (Mr. R. H. Bicknell)	6,604
9.—	**Hinckley.** For the construction of sewage pumping main (Mr. W. M. Cross)	1,065
9.—	**Leicester.** For the provision of county offices (Mr. Edgar Dudley)	13,150
9.—	**Rotherham.** For works of sewerage and the purchase of a motor wagon (Mr. F. O. Stanford)	15,045
9.—	**Welwyn.** For the erection of dwellings (Mr. Courtenay Clifton)	4,505
10.—	**Abersychan.** For the purposes of roads and bridges (Mr. A. G. Drury)	
10.—	**Bolton.** For burial ground extension (Mr. W. O. E. Meade-King)	4,701
10.—	**Coventry.** For the purposes of an abattoir and sewage disposal (Mr. W. M. Cross)	4,100
10.—	**Sheffield.** For the provision of public baths (Mr. F. O. Stanford)	24,214
10.—	**Willesden.** For the provision of public baths (Mr. Edgar Dudley)	1,430
10.—	**Wrexham.** For works of sewerage (Mr. R. G. Hetherington)	1,207
11.—	**Beckenham.** For pleasure ground extension (Mr. Edgar Dudley)	2,900
11.—	**Blackburn.** For street improvement (Mr. F. O. Stanford) ...	35,200
11.—	**Colchester.** For hospital extension (Dr. I. P. Candler)	3,110
11.—	**Runcorn.** For road widening (Mr. W. O. E. Meade-King)	270
11.—	**St. Albans.** For works of sewage disposal (Mr. W. M. Cross)	48,977

THE CLEETHORPES AND SCARBOROUGH MEETINGS.

As we go to press we learn that, while the meeting of the Institution of Municipal and County Engineers arranged for the 26th inst. at Scarborough has been cancelled, the one at Cleethorpes on the 19th inst. will duly take place.

2nd London Sanitary Company. R.A.M.C.T.—A few vacancies will probably occur in the 2nd London Sanitary Company, and those who wish to join this company for sanitary service should send in their names to the secretary of the Royal Sanitary Institute, at the offices, 90 Buckingham Palace-road, for forwarding to the proper authorities.

Recruits for Field Ambulance Detachments.—The Royal Sanitary Institute has been officially asked to make known to the members and associates a requirement by the War Office for the immediate formation of four field ambulance detachments (Territorial Force), consisting in the aggregate of 7[illegible] men. This requirement should especially appeal to those connected with the institute, because of their interest in and knowledge of sanitation and preventive measures, and it is hoped that this opportunity for sharing in the national service will be readily responded to. Applicants for enrolment should apply to the Duke of York's Headquarters, Chelsea (entrance by Turk's-row-gate, off Lower Sloane-street; office is immediately opposite the gate). It is proposed to arrange at the institute lectures and demonstrations for the recruits.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works, of which particulars appear below: Buildings—Darwen £6,541, Sowerby Bridge £7,000, housing and town planning—Wallsend; roads and materials—Chelmsford, East Barnet £6,283, Lowestoft £13,100, Ramsgreen £11,000, Rochdale £10,000, St. Pancras £13,250; sewerage and sewage disposal—Llandilo, Manchester £138,000; water, gas and electricity—Coventry. Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Brierley Hill R.D.C.—The surveyor, Mr. J. L. Harpur, has prepared plans for three underground conveniences which will be considered at the next council meeting.

Bury (Lancs) T.C.—The council have accepted with thanks an offer of Colonel Barlow to purchase certain land adjoining the Barlow recreation ground, and to build baths and washhouses on part of it at the expense of the residents.

Darwen T.C.—It has been agreed to reconstruct the swimming baths and washing baths, at an estimated cost of £6,541.

Failsworth U.D.C.—A decision has been reached to build public baths from plans by Messrs. Woodhouse & Howard, of Manchester.

Sevenoaks R.D.C.—Proposals are being considered for the extension of the isolation hospital, at an estimated cost of £1,500.

Sowerby Bridge U.D.C.—A scheme is under consideration for the provision of public baths at an estimated cost of £7,000.

Warrington T.C.—The tenders of Messrs. J. Broadhurst & Sons, at £105 and £300 respectively, have been accepted for the construction of public conveniences.

HOUSING AND TOWN PLANNING.

Aldeburgh T.C.—The council have passed a resolution expressing their willingness to take back a portion of the land let to the local electric supply company, in order that it should be let on building lease for artisans' dwellings.

Billinge U.D.C.—It has been resolved to take the steps necessary for the erection of eight houses under the Working Class Dwellings Act.

Gwyrfai R.D.C.—The tender of Messrs. Williams Brothers, of Brynthir and Llanberis, at £6,977, has been accepted for the erection of workmen's dwellings in the quarry villages of Ebenezer and Clwtybont.

Lanarkshire C.C.—The Middle Ward District Committee have resolved to approach the Local Government Board to ascertain what support the Government would give, under the Housing Act, to enable the local authority to erect workmen's houses, a tentative scheme for which was submitted.

Wallsend T.C.—A report of the Housing Committee has been adopted recommending that 100 houses should be provided without delay, and that the Local Government Board should be asked to give sanction to the council to sell 8 acres of corporation land at a price which would induce builders to erect houses of the class required at an early date. It was also resolved that investigations in the Willington Quay and Willington districts should be expedited with a view to assisting the council to determine where the houses should be built.

REFUSE COLLECTION AND DISPOSAL.

Ilfracombe U.D.C.—The surveyor, Mr. O. M. Prouse, has prepared a scheme for the erection of a destructor at Rockson Farm, at an estimated cost of £1,100, to which the council will give consideration at the next meeting.

ROADS AND MATERIALS.

Barking U.D.C.—A new footpath is to be constructed in Water-lane at a cost of £208.

Belfast T.C.—The Improvement Committee have adopted the recommendation of a subcommittee for the execution of street widening and other works which would provide employment as relief labour. The city surveyor has been instructed to have portions of Peter's-hill, Shankill-road and Falls-road widened as soon as the necessary preliminaries with regard to the acquisition of land have been completed.

Bentley U.D.C.—A widening scheme on the Doncaster and Selby main road has been approved, the cost being estimated at £2,100.

Bridgwater R.D.C.—The surveyor, Mr. W. A. Collins, has prepared a scheme for the improvement of Dame Withycombe's Hill, at Otterhampton, and it has been decided to ask the Road Board for a grant for carrying it out. The surveyor is in preparation several other improvements to submit to the county council, and he also advises the purchase of another steam roller. The council will discuss this latter proposal at the next meeting.

Bridlington T.C.—The council are seeking to expedite loans for the carrying out of the widening of St. James-street, Forty-foot-road, Hilderthorpe-road, the improvement consequent upon the acquisition of the Priory Approach Trustees' property in Cemetery-road, Nunkeeling, Pinfold-street, Kirkgate and Bayle-gate, and also to carry out other improvements.

Bristol T.C.—At the meeting of the Sanitary Committee last week the city engineer, Mr. L. S. McKenzie, and his staff were congratulated upon having kept their demands so well within the half-year's estimate, and it was stated that a schedule of the work it was proposed to do had already been sent to the Road Board. The city engineer suggested that the widening of the Avonmouth-road between West Town-lane and Cook-street should be added. The chairman, Alderman Lloyd, thought it would be well if the city engineer made a further general survey of the city, with a view to ascertaining if any further works could with advantage be added to the list which had already been prepared.

Chelmsford T.C.—It has been agreed to proceed at once with the laying of wood paving in Duke-street, from the Golden Lion to the railway arches. The borough engineer, Mr. P. T. Harrison, has submitted to the county council a scheme for widening Galleywood-road, at an estimated cost of £5,000.

Dublin T.C.—The Cleansing Committee have issued a report in which it is stated that they had under consideration the question of improved street cleansing and watering, and went closely into the methods now generally adopted for carrying on this work by means of mechanically propelled machines. By arrangements with the tramway company experimental night watering was carried out with the company's watering wagon, the result proving very satisfactory. During the period of experiment the wagon covered about 16 or 17 miles of streets per night, and it was found that this wagon was capable of amply watering most of the streets from pathway to pathway with one journey. On two nights, when the work was at its best, eight wagonloads of water were distributed in this way, the capacity of the wagons being 3,000 gallons, and the cost working out at about 7s. per night. Advertisements were subsequently inserted by the committee for tenders for a motor watering wagon, and likewise for tenders for motor sweeping machines, and a report on this matter will be submitted to the council.

East Barnet U.D.C.—An estimate for slab-paving of £6,283 has been submitted to the General Purposes Committee, and this committee have appointed a subcommittee to go round the district with the surveyor, Mr. H. York, and examine the footpaths included in the estimate.

Hull T.C.—The Works Committee will complete the widening of Pickering-road, widen Hedon-road to the extent of the land recently purchased, widen and make up Far Saltings-lane, between Cottingham-road, tar-paint macadam roads by hand instead of by machine, make up gravel verges on the Boulevard, St. George's-road and other streets where desirable. They will also employ a fourth repairing gang, and level material into the pond at the Ringrose-street tip. The committee will also carry out a number of outstanding paving works in a number of streets, for which the corporation have obtained loans.

Ilford U.D.C.—[illegible] have adopted the [illegible] Mr. H. Shaw for the widening of Wanstead [illegible] Road Hill.

Liversedge U.D.C.—The Road Board have [illegible] with regard to the [illegible] Mr. A. [illegible] roads.

Lowestoft T.C.—The borough surveyor, Mr. G. H. [illegible] the Local Government Board for sanction to borrow [illegible] £230 for [illegible] make application to the Road Board for a grant in aid [illegible] Messrs. [illegible] at £[illegible], have been accepted for the supply of a steam roller.

Ramsbottom U.D.C.—[illegible] have been [illegible] Mr. [illegible]

Rhyl U.D.C.—It has been agreed to carry out the scheme prepared by the surveyor, Mr. A. A. Goodall, [illegible] A combined screen and shelter will be erected between [illegible] and a roof projecting over the seats on both sides. At a later date the council will consider the laying out of the remaining portion of the sands between High-street and the Marine Gardens, in order to check [illegible]

Rochdale T.C.—A scheme is being considered for a new road from William Henry-street to Castleton. The cost is estimated at £[illegible].

St. Austell R.D.C.—Steps are to be taken to obtain grants from the Road Board for road widenings, the construction of short pieces of new road, and the cutting off of corners.

St. Pancras B.C.—A special committee have submitted a list of streets which could be repaired at a total cost of £13,259.

Salford T.C.—The Improvements Committee have [illegible] proceed with a scheme for the widening of Whit-lane [illegible] Cemetery, and widen the footpath leading from Eccles Old-road to Bolton-road.

Sudbury T.C.—In respect of the proposed reconstruction of the road at Ballingdon Hill the council have submitted to the Road Board (through the West Suffolk County Council) a request for a contribution of £1,000.

Totnes T.C.—The tender of the Edison Steam Rolling Company has been accepted for steam rolling for the ensuing year.

Watford R.D.C.—A scheme has been adopted for making up three new roads at an estimated cost of £1,200.

SEWERAGE AND SEWAGE DISPOSAL.

Barnstaple R.D.C.—A scheme of sewerage for [illegible]

Carlisle R.D.C.—The engineer, Mr. J. Graham, has received instructions to prepare a report on the treatment of the effluent, the disposal of the effluent from the sludge pit, the renewing of the coping of the wall of the circular tank, and as to the improvement of the grounds attached thereto.

Colne T.C.—Sewer extensions estimated to cost £259 have been approved.

Llandilo R.D.C.—The council have agreed to proceed with the Ffairfach and Bryncamarian drainage schemes.

Manchester T.C.—A scheme is being considered for the extension of the Davyhulme sewage disposal works, at an estimated cost of £97,000, and the corporation are also recommended to carry out sewer extensions at an estimated cost of £41,000.

Redruth R.D.C.—Mr. A. F. Bassett, of Camborne, [illegible] £500 towards a scheme for a tunnel through the North Cliffs to take away the sewage, and the council have decided to confer with the Redruth Urban District Council on the subject.

Salford T.C.—The Rivers Committee, if relief works are started, can find employment for a number of men [illegible] the excavation necessary for new filter-[illegible] Mead West sewage works.

WATER, GAS, AND ELECTRICITY.

Coventry T.C.—It has been agreed to construct a new storage reservoir at Coundon.

St. Pancras B.C.—The Electricity and Public Light-[illegible] Committee have been instructed to report upon a proposal by the chief engineer to expedite the laying of electric mains, including a power main, to Regent's Park electric light station.

MISCELLANEOUS.

Barking U.D.C.—It has been resolved to enlarge the lake in the recreation ground, at an estimated cost of £1,085, and to remove the hedge at the Water-lane [illegible] at a cost of £[illegible].

Blackpool T.C.—A scheme for a new cemetery has been agreed upon, the cost of the work being estimated at £4,000.

Leek U.D.C.—The surveyor, Mr. W. E. Beacham, has received instructions to prepare for each of the committees [illegible] which the council had [illegible] expediting the various works.

Maldon R.D.C.—Immediate application is to be made to the Treasury for a development grant, estimated at £[illegible],000 for the purpose of deepening the Woodrope Creek at Tollesbury, to enable it to be navigable by large vessels, and thus add to the facilities of the port.

PERSONAL.

Mr. John Rourke has been appointed county surveyor of Kildare, and will take up his duties on January 1st next.

Mr. Harold Cordon, who has acted as assistant to his father at Belper, has been appointed surveyor to the Freebridge Lynn (Norfolk) Rural District Council.

Mr. Basil H. Noble, surveyor to the Alford Urban District Council, has been appointed engineer and surveyor to the Farsley (Yorks) Urban District Council.

Mr. O. Hilton, engineering assistant to the Watford Urban District Council, has been unanimously appointed second assistant surveyor to the Heston and Isleworth Urban District Council. Mr. Hilton is an associate-member of the Institution of Municipal and County Engineers, and a professional associate of the Surveyors' Institution.

Mr. W. R. Crabtree, the surveyor to the Doncaster Rural District Council, had a somewhat unpleasant experience at an East Coast health resort, where he has been spending a holiday. His favourite recreation is water-colour painting. While engaged in this a soldier appeared on the scene, and Mr. Crabtree was promptly taken before an officer. Explanations soon enabled him to establish his *bona fides*, and he was immediately released.

Mr. E. Young Harrison, Assoc.M.Inst.C.E., who, as reported in these columns last week, has been unanimously appointed borough surveyor and water engineer of Guildford, was born at Folkestone in 1879. He was articled to the late Mr. F. D. Clark, Assoc.M.Inst.C.E., the then borough surveyor of Reigate, and on Mr. Clarke's retirement completed his articles with Mr. W. H. Prescott, Assoc.M.Inst.C.E., the succeeding surveyor. He carried out, under Mr. Prescott, the experimental bacterial works and assisted in the preparation of plans for the works of sewage disposal, also the plans for new infectious diseases hospital. He acted as resident engineer on a pumping scheme with Shone's ejectors and air compressors for three low-lying districts, and his designs for municipal buildings, fire station and police offices were awarded third premium in open competition. In 1899 he was appointed district surveyor and private street works assistant at Richmond, Surrey, and among the other works upon which he was engaged were street improvements, additions to corporation depot, foul and surface water sewers, clearing Red Lion-street insani-

[illegible] In 1902 he became the position of engineering assistant in the Sewerage and Sewage Disposal Department of the Leicester Corporation, [illegible] the general and important undertakings [illegible] were the provision [illegible] for the Newark [illegible] at Beaumont Leys, [illegible] and the extension of the sewerage system at Braunstone, including storm overflows and [illegible] all of which works he supervised during construction. In 1906 Mr. Harrison was appointed

Mr. E. Young Harrison,
[illegible] Borough Engineer.

surveyor and water engineer to the Wellingborough Urban District Council. During the succeeding 8½ years he has carried out extensions to the duplicate sewerage system, new power plants to water-pumping stations, and water-softening works, depot buildings, reinforced-concrete water tank, bandstands, public conveniences, river bathing place, important street improvements, and the tar-macadamising of a considerable mileage of streets. He is a [illegible] member of the Institution of Civil Engineers, and of the Institution of Mechanical Engineers, and a member of the Institution of Municipal and County Engineers and of the Institution of Water Engineers.

FOR OTHER ADVERTISEMENTS
See End of Paper.

EXPERIENCED CIVIL ENGINEERS (age 30 to 35) willing to give their services unreservedly at the disposal of the War Office during the war should [illegible] particulars of their experience, age, and [illegible] to Hugh P. Raines [illegible], 61 Temple-row, Birmingham.

N.B.—All particulars sent will be registered for reference when required, but cannot be individually acknowledged, and no questions can at present be answered except in [illegible] (1,895)

BOROUGH OF GODALMING.
ASSISTANT IN SURVEYOR'S OFFICE.

[illegible] Assistant [illegible] to assist in the preparation of plans and tracings, and the general work of the Surveyor's Office, at a salary of 30s. weekly.

[illegible] ledge of surveying and levelling, and have had previous experience [illegible]

Applications, with copies of three testimonials, endorsed "Assistant," to be sent [illegible] not later than Tuesday, 22nd September, 1914.

ALAN BROMLY,
Borough Surveyor.

Municipal Offices,
Godalming.
September 2, 1914. (1,898)

TEMPORARY ASSISTANT required at once in the Surveyor's Office, Hayes. Must be a good draughtsman, accustomed to the design of Cottages and able to make small surveys. Salary, £2 per week. Apply, in writing only, stating age and experience, to the Surveyor, Council Offices, Hayes, Middlesex. (1,886)

BOROUGH OF OSSETT.
FIRE BRIGADE.

Wanted, an experienced Motor Fire Engine Driver and a Storekeeper at the Corporation Depot. Applicants should have a good practical knowledge of Motor Fire Engines and Repairs.

Wages, 30s. per week, with house, coal and gas free. A list of duties may be obtained from the undersigned.

Applications, together with copies of two recent testimonials, or references, to be forwarded to T. W. Wilson, Esq., Town Clerk, Ossett, and endorsed "Motor Fire Engine Driver and Storekeeper," not later than 10 a.m., September 14th, 1914.

H. HOLMES, M.INST.C.E.I.,
Borough Surveyor.

September 2, 1914. (1,894)

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL.
REFUSE DESTRUCTOR.

The above Council are prepared to receive Tenders from experienced firms for the erection of a Refuse Destructor, with Steam Boiler, Auxiliary Machinery, &c., complete.

Copies of the General Conditions, Specification, Form of Tender and Plans, may be obtained from the Consulting Engineer, Mr. E. M. Lacey, M.INST.C.E., 2 Victoria-street, Westminster, S.W., on payment of a deposit of five guineas, which will be refunded on receipt of a *bonâ-fide* Tender. Duplicate copies can be obtained on payment of one guinea, which will not be returned. Any further particulars may be obtained from Mr. William Jones, ASSOC.M.INST.C.E., the Council's Engineer and Surveyor, Council Offices, Colwyn Bay.

Tenders must be in the form attached to the Specification, and must be delivered to me not later than 11 o'clock in the forenoon on Thursday, the 8th day of October, 1914, in sealed envelopes, endorsed "Tender for Refuse Destructor."

The Council do not bind themselves to accept the lowest or any of the Tenders sent in.

JAMES AMPHLETT,
Clerk to the Council.

Council Offices,
Colwyn Bay.
September 2, 1914. (1,896)

THE SURVEYORS' INSTITUTION
(Incorporated by Royal Charter).
12 Great George-street, Westminster, S.W.

EXAMINATIONS, 1915.

PRELIMINARY EXAMINATION.

Notice is given that the Preliminary Examination for the admission of Students will be held on the 13th and 14th of January next.

Candidates from the counties of Lancashire, Cheshire, Yorkshire, Durham, Cumberland, Westmorland, Northumberland, Staffordshire, and North Wales will be examined at Manchester. Candidates from other counties in England and Wales will be examined in London.

Irish Candidates will be examined in Dublin.
Scottish Candidates in Glasgow.

PROFESSIONAL EXAMINATIONS.

Notice is also given that the Annual Professional Examinations for Land Agents, Valuers, Building and Quantity Surveyors (held under the provisions of the Charter) will be held on the 22nd to 26th of March next inclusive.

MINING SURVEYORS' EXAMINATION.

The newly instituted Examinations for Mining Surveyors will be held at the same time.

All English Candidates for the Professional Examinations are examined in London.

Irish Candidates in Dublin.

Scottish Candidates in Glasgow.

All applications for both the Preliminary and the Professional Examinations must be sent in before the end of September. The necessary Entry Forms for the various Examinations, and particulars as to subjects, course of examination, prizes and scholarships can be obtained of the Secretary. (1,897)

The Town Planning Procedure Regulations, 1914.*

By HENRY E. STILGOE, M.Inst.C.E., City Engineer and Surveyor of Birmingham

[illegible] board that it was desirable to amend the Procedure [illegible] The deputation [illegible] the Right Hon. John Burns, M.P., President of the Local Government Board, on December 5, 1913, when the President gave very careful attention to the matter and before long. The new regulations issued on February 11, 1914, [illegible] work entailed in the preparation of town planning [illegible]

The following notes will serve to point out the principal [illegible] the new regulations.

Article II.—The reduction, from two months to four weeks, for the period required to elapse between the [illegible] and the application to the board for authority to prepare the scheme, is a distinct advantage. To appreciate the effect of this alteration it must be remembered that the land becomes "bound" for the purposes of the scheme (as indicated in sec. 58, subsec. 2 of the Act) from the date of the application by the local authority for permission to prepare a scheme. Under the original regulations the preliminary notice was given to owners, &c., two months before this date, during which period they could commit acts (such as entering into building agreements, &c.) prejudicial to the scheme. The reduction of this interval to four weeks minimises, but does not remove, the danger. The remedy suggested by the institution was that the land should be "bound" from the date of the notice to owners, &c., of the intention to prepare the scheme, instead of from the date of the application. The omission of all requirements as to service of notices on occupiers of lands will be a great saving of time and money, and, as will be observed under Article XXVII, of the new regulations, the word "owner" or "owners" has the same meaning as in the Lands Clauses Acts.

Article III.—The first meeting of owners required under the original regulations may be dispensed with, in accordance with the alternative set out in Article III. This alternative is the serving of notice upon the "prescribed persons" that the local authority is prepared to confer with them. This need not be a separate notice, but may be included in the first notice (required by Article II., c.).

Article IV.—Map No. 2 is required to be submitted to the board with the application by the local authority for permission to prepare a scheme. Map No. 1 may be converted into Map No. 2 by the addition of certain further particulars. It is a great relief that it is now unnecessary to show the sewers, and the gas, water, electric and other mains upon this map. It is, however, necessary to show the new buildings—that is to say, to bring the Ordnance Survey map up to date, and show such new buildings by a distinctive colour. The regulations do not demand it, but it is presumed that new streets constructed since the date of the latest edition of Ordnance Survey must also be shown.

Article V.—Under the old regulations, among the documents, &c., to accompany the application for permission to prepare a scheme was "Map No. 3," which was to the scale of 1 in. to the mile, and showed by distinguishing colours, the district of the local authority, the land included in the scheme, and the area within 5 miles from any part of the district of the local authority. In the new regulation this map is not required.

Article V. (*g*).—When applying for authority to prepare a scheme, it is necessary, under the new regulations, to give information as to the need for improved means of communication (widenings of streets and proposed construction of new streets), as to stopping up and diverting roads, and as to the allocation of lands for open spaces, &c. Such information was not required as a statement under the original regulations, but had to be shown on Map No. 2 instead.

* [illegible]

Article VI. [illegible] schedule of the Act, ask for an estimate of the cost [illegible] to prepare [illegible] expenditure [illegible] the application, and (2) any other local authority, shall be indicated." The estimate, if it is of any use [illegible] to make it; therefore the local authority preparing the scheme must have given very considerable thought to the proposed roads, open spaces, and other matters; [illegible] As a town planning scheme will include the works incidental to planning and laying out of streets, the acquiring of lands for open spaces, &c., many of which works it is not necessary to carry out for several years, it will be appreciated that as development proceeds it may be necessary to vary portions of the scheme. [illegible] is concerned, it is only useful and necessary to include [illegible] of the preparation of the scheme, and of acquiring the properties necessary for the laying out of streets, and for open spaces, allotments, &c.

Article VIII provides that, when authority has been given by the board for the preparation of a scheme by a local authority, notice shall be given by advertisement in a local newspaper. This dispenses with the serving of individual notices required under the original regulations.

Article X.—When the local authority have fully considered and developed their proposals, they shall cause to be printed a draft scheme embodying these proposals, and shall cause Map No. 3 (new number) to be prepared. This map is to have shown upon it very much the same information as was required by the old regulations for Maps Nos. 2 and 4, except that it is unnecessary to show the sewers, gas, water and electric mains, &c.

Article XIII.—When the local authority have decided upon the scheme to be submitted to the board for their approval, they shall make an Order under their Seal, and shall prepare Map No. 4, provided that if [illegible] identical with Map No. 3, then Map No. 3 may be used for the purpose of Map No. 4. As, in many cases, it will be found that Map No. 4 will not be identical with Map No. 3, it would appear reasonable that the board should allow, where practicable, Map No. 3 to be amended in some distinctive manner, [illegible] Map No. 4. This would save a good deal of unnecessary expense. The amended regulations indicate that the board would be willing to adopt such a course, for after the words "identical in all respects" have been added the words "or if the board consent under Article XXVI.," which Article provides that the board may dispense with or vary the requirements of the regulations.

Article XV.—Map No. 5 (the Ownership Map) is required to be submitted by the local authority to the board when making application for the board's approval to the scheme. Under subsec. (*f*) the names and addresses of the owners of each parcel of land included in the scheme, and the approximate extent of each such parcel, must be supplied. This, in the case of areas built up with a lot of small property, would entail a great deal of work, and it does not appear that the result will be useful. Perhaps the board will relax this requirement under the powers conferred upon them by Article XXVI. It will be observed that the map to the scale of 6 in. to the mile, known as Map No. 6 under the original regulations, is not now required.

Article XVI.—An estimate of expenditure and receipts is required in the same terms as was formerly required under Article XXII. of the old regulations. (See remarks as to estimate under Article VI. above.)

Article XVIII.—When the Local Government Board send to the local authority a draft order approving the scheme, it is not necessary (as under the original regulations) to send a copy of the Order to owners, lessees and occupiers, &c.; a notice to the prescribed persons that the draft Order has been received and may be inspected, &c., is all that is required.

Article XXVII (interpretation of terms) states that the word "owner" or "owners" has the same meaning as in the Lands Clauses Acts. The Lands Clauses Consolidation Act, 1845, gives the following definition:

Where, under the provisions of the special Act, or any Act incorporated therewith, any notice shall be required to be given to the owner of any lands, or where any act shall be authorised or required to be done with the consent of any such owner, the word "owner" shall be deemed to mean any person or corporation who, under the provisions of the special Act, would be entitled to sell and convey lands to the promoters of the undertaking.

Article XXVIII. revokes the original regulations 1906, except in so far as they apply to the adoption by the local authority of any scheme prepared by any owner or owners of land.

[The foregoing notes refer to the more important alterations but we would recommend those of our readers who desire fuller information to obtain a full copy of Mr. Stilgoe's paper, which contains a table comparing, article by article, the new regulations with the original regulations so far as the latter have been altered or added to.]

On the presentation of Mr. Stilgoe's paper at the annual meeting of the Institution of Municipal and County Engineers at Cheltenham.

Mr. J. W. Cockrill (Yarmouth) proposed a vote of thanks to Mr. Stilgoe.

Mr. T. Adams (Local Government Board) said that at the Yarmouth conference he was asked to convey to the board a resolution passed by them regarding the procedure in drafting, and the result was due, in large measure, to that resolution. The board invited a deputation from the institution to meet them, with the result that the necessary amendments were made. Any question of recasting the regulations in future would probably require an amending Act, and whether that was desirable or not he could not say.

Mr. J. A. Brodie (Liverpool) said that Mr. Stilgoe's paper would be very valuable so long as regulations of a somewhat complicated nature were necessary in connection with town planning. Municipal engineers, however, were not too keen on regulations of this type, and hoped that when the law on town planning came to be simplified care would be taken that the municipalities were given a freer hand than at the present time, since a good deal of the work could be cut down in many respects.

The President (Mr. J. S. Pickering) also expressed his thanks to Mr. Stilgoe for a paper which he said would be of great service for a long time to come.

The vote of thanks was then duly accorded.

KENT ROADS.

NEW COUNTY SURVEYOR'S REPORT.

Mr. H. T. Chapman, who recently succeeded Mr. Maybury as county surveyor of Kent, has issued his first annual report upon the maintenance and repair of the rural main roads of the county, and of main roads situated in non-retaining urban areas. The total mileage is 600¼.

The actual cost of maintenance, tar-painting and improvement work carried out during the year ended March 31st last was £157,421. Towards this expenditure £30,272 was actually received in the account year from the Road Board, £1,960 19s. 8d. is a credit due in respect of repairs to roads over railway and county bridges, and the sum of £1,120 8s. 1d. is also a credit in respect of contributions received towards the cost of improvements, scavenging, repairs to trenches, sale of old iron, &c., leaving a net expenditure of £124,067 18s. 2d. out of county funds, which equals £206·6 per mile.

Over £52,516 was expended upon tar-painting, widenings, bridge construction, kerbing, channelling, paving and drainage works, and represents £87·4 per mile.

In arriving at this figure it must, however, be borne in mind that credit has not been taken, as has been the custom in previous years, for the amounts received in respect of fees for traction-engine licences, drivers' licences, and the registration of motor cars. These receipts during the year under review amounted to £5,634 1s.

The total cost of tar-painting carriageways amounted to £26,195 16s. 5d., 956,625 gallons of tar having been used, the area treated being, approximately, 5,750,000 super. yds. There was also 22,086 gallons of tar used in the repairing of footpaths.

The payments for tar alone represented £11,996 3s. 11d., the average price paid per gallon being 2·9d.

To the urban authorities the county council paid £7,136 for the tar-painting of 1,532,868 super. yds. of carriageways. Tar-painting proper, therefore, cost the county council during the year £33,332.

During the year 3,208¼ tons of pitch and 204¼ tons of bitumens were used as a matrix for binding granite macadam and "carpeting" work. The cost of this material was over £10,579.

A table in the report shows that the total quantity of material used upon the roads under direct control was 134,185 tons or yards.

The area of carriageway so treated was 734,490 super. yds., or, approximately, one-eighth of the whole.

The average price per ton for granite macadam, exclusive of haulage, was 10s. 11·34d., as compared with 10s. 3·12d. in the previous year, this being an increase of 8·22d. Of the total quantity of material used 34,450 tons consisted of granite macadam, and 18,735 tons of Kentish rag tarred macadam.

Mr. Chapman gives as the average daily cost of working a steam roller, including repairs, coal, oil, waste, scarifying tynes, insurance, driver and attendant, the figure of 20s. 3d., that of a steam motor, including all charges £1 2s. 3d., and that of a petrol heavy motor £1 12s. 7d.

The total cost of haulage during the year amounted to £17,844, of which £9,806 6s. 10d. was in respect of hired team labour and mechanical haulage.

Mr. Chapman remarks that attention has frequently been drawn to the enormous amount of damage caused to the main roads by the heavy traffic which is being put upon them, and which is increasing daily. The water-bound macadam roads are quite unable to withstand the traction engines, steam and petrol motors and motor omnibuses now using all the important main roads, and especially so when the crust is weak and the subsoil consists of clay. Mr. Chapman finds that the quarters of the roads are in many places becoming distorted and pushed out by this traffic, which now uses the sides to a much greater extent than formerly, owing to the large amount of quick motor-car traffic. "Considerable expenditure will, therefore," he says, "be involved in strengthening the roads before resurfacing them, and I think the Road Board should be urged to contribute largely towards this necessary work in addition to the cost of surfacing with improved materials. Pitch-grouting and local tarred macadam form an excellent base, and I trust we shall, with the aid of the Road Board, be enabled to coat large areas with a surfacing consisting of local gravel and sand, treated with natural bitumens."

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.Inst C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. Dudley Robinson, B.Sc.(Lond.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

B. Wyand,
Secretary.

39 Victoria-street, S.W.

ROYAL SANITARY INSTITUTE.

YORK MEETING.

On Saturday, October 24th, at a meeting of the Royal Sanitary Institute at York, Mr. E. W. Spon, [illegible] on the Relationship of the Institute to the York Sewage [illegible]

[illegible] will be given to the pumping station at Fulford, the works at Naburn, and the new Earswick housing village.

[illegible] Institute examination for sanitary officers will commence on Monday, Sept. [illegible] 21st.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES, SANITARY SURVEYOR, AND SURVEYOR OF HIGHWAYS. Sept. [illegible] Uttoxeter Urban District Council. £110 per annum.—Mr. Frank T. Hawthorn, clerk, Council Offices, Uttoxeter.

ASSISTANT TO COUNTY SURVEYOR. September 7th.—Pembrokeshire County Council. £150 per annum.—Mr. Arthur H. Thomas, county surveyor, Haverfordwest.

SURVEYOR. September 7th.—Okehampton Town Council. £100 per annum.—Mr. J. J. Newcombe, town clerk.

CLERK OF WORKS. September 7th.—Bedwellty Urban District Council. £3 per week.—Mr. T. J. Thomas, clerk, 36 High-street, Bargoed.

INSPECTOR OF NUISANCES.—September 8th—10th. Leigh Rural District Council. £120 per annum.—Mr. E. Williams, clerk, 5 Market-place, Leigh.

TEMPORARY ARCHITECTURAL ASSISTANT. September 9th. Morley Town Council. Mr. Fred Thackray, town clerk.

ASSISTANT SURVEYOR.—September 12th.—Swansea Rural District Council. £120 per annum.—Mr. E. Harris, clerk, Alexandra-road, Swansea.

ASSISTANT SURVEYOR.—September 12th.—Devon County Council. £150—£200.—Mr. R. M. Stone, county surveyor (No. 1 Division). The Square, Barnstaple.

TEMPORARY SURVEYOR'S ASSISTANT.—September 14th.—Aylesbury Urban District Council. £75 per annum.—Mr. W. Harold Taylor, engineer and surveyor.

BUILDING INSPECTOR.—September 14th.—West Ham Town Council. £150—£200 per annum.—Mr. H. W. Greaves, town clerk.

CLERK OF WORKS.—September 14th.—Aberystwyth Rural District Council. £3 3s. per week.—Mr. H. Hughes, clerk, 8 Market-street.

ENGINEERING ASSISTANT.—September 14th.—Watford Urban District Council. £80—£100 per annum.—Mr. D. Waterhouse, engineer.

SURVEYOR AND ENGINEER.—September 14th.—Wellingborough Urban District Council. £350 per annum.—Mr. J. T. Parker, clerk, 29 Church-street, Wellingborough.

ELECTRICAL ENGINEER.—September 15th.—Corporation of Swansea. £500 per annum.—Mr. H. L. Coath, town clerk.

DIVISIONAL SURVEYOR.—September 15th.—West Suffolk County Council. £145 per annum.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

BOROUGH SURVEYOR.—September 15th.—Corporation of Swansea. £500 per annum.—Mr. W. Lang Coath, town clerk, Guildhall, Swansea.

CHIEF DRAUGHTSMAN.—September 30th.—City of Westminster. £200—£250 per annum.—Mr. John Hunt, town clerk, City Hall, Charing Cross-road, W.C.

ARCHITECTURAL AND SURVEYING ASSISTANT.—Middlesex County Council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

ASSISTANT ENGINEER. Nyassaland Public Works Department. £200—£300. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

BOROUGH ENGINEER AND SURVEYOR. Corporation of Salford. £900—£1,100. Mr. L. C. Evans, town clerk, Town Hall, Salford.

ENGINEERING AND SURVEYING ASSISTANTS to Middlesex County Council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster, S.W.

FOREMAN OF WORKS. Nigeria. £240—£300. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

INSPECTOR OF WATERWORKS.—Federated Malay States. £180—£280. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT CLERK OF WORKS.—Barrow-in-Furness Town Council. £2 10s. per week.—Borough Engineer and Surveyor.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

GATESHEAD. September 10th. Designs for a school for 700 scholars, for the Education Committee. The Clerk to the Committee, Town Hall.

GLASGOW. September 18th. Plans for buildings proposed to be erected at the north-west corner of Trongate and High-street. Premiums, £50, £30, and £25.—Mr. J. Lindsay, town clerk.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BIRMINGHAM.—September 7th.—For alterations to public baths, for the corporation.—Mr. R. Hoggins, superintendent engineer, Kent-street, Birmingham.

LEEDS.—September 7th.—For the extension of the meat market, for the corporation.—Mr. W. S. Braithwaite, architect, 6 South-parade.

SHEERNESS.—September 7th.—For the demolition of engine-house and the construction of a new building and other works, for the urban district council.—Mr. F. W. S. Stanton, engineer, 3 Victoria-street, Westminster, S.W.

WEST RIDING.—September 7th.—For widening a bridge, for the county council.—Mr. F. G. Carpenter, West Riding surveyor, County Hall, Wakefield.

GLASGOW.—September 8th.—For the erection of a shelter and convenience, for the corporation.—Messrs. F. Burnet & Boston, 180 Hope-street, Glasgow.

HAMPSHIRE.—September 8th.—For the erection of a police cottage, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

ILFORD.—September 8th.—For the erection of workshops at the electricity works, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

NEWPORT (Mon.).—September 8th.—For alterations to fire station and erection of firemen's dwellings, for the corporation.—Mr. C. F. Ward, borough architect, Town Hall.

ILFORD.—September 8th.—For the erection of refuse destructor buildings, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

WELLINGBOROUGH.—September 8th.—For the erection of a public convenience, for the urban district council.—Mr. E. Y. Harrison, surveyor.

YORK.—September 9th.—For the erection of a shelter, for the corporation.—Mr. F. W. Spurr, city engineer, Guildhall.

KENT.—September 9th.—For the execution of works at certain schools, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

STOCKPORT.—September 9th.—For the erection of a mortuary, for the corporation.—Mr. J. Atkinson, borough surveyor.

FARNWORTH.—September 12th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

CORNWALL.—September 12th.—For the erection of a school, for the Education Committee.—Mr. B. C. Andrew, architect, Biddick's-court, St. Austell.

EVESHAM.—September 12th.—For the erection of forty-six cottages, for the rural district council.—The Clerk.

HALIFAX.—September 14th.—For the erection of a store shed and alterations to existing buildings, for the corporation.—Mr. J. Lord, borough engineer.

BRADFORD.—September 16th.—For the erection of eight workmen's dwellings, for the corporation.—Mr. F. Stevens, town clerk.

BRISTOL.—September 17th.—For the erection of a school (builder's and plumber's work), for the Education Committee.—Mr. W. S. Skinner, architect, 27 Orchard-street, College-green, Bristol.

DERBYSHIRE.—September 18th.—For the erection of two schools, for the Education Committee.—Mr. G. H. Widdows, architect, County Offices, St. Mary's Gate, Derby.

CAMBRIDGE.—September 19th.—For the erection of cottages, for the corporation.—Borough Surveyor.

ILFORD.—September 22nd.—For the erection of a sanatorium, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

DUNDEE.—September 7th.—For the supply of cast-iron pipes, for the Water Commissioners.—Mr. G. Baxter, engineer and manager, 93 Commercial-street, Dundee.

EDINBURGH.—September 8th.—For the supply of 400 tons of 9-in. dry sand cast-iron pipes, for the Water Trustees.—Messrs. J. & A. Leslie & Reid, 12 St. Giles-street, Edinburgh.

MANCHESTER.—September 15th.—For the supply and erection of steel storage shelving, for the Tramways Committee.—Mr. J. M. McElroy, general manager, corporation tramways, 55 Piccadilly, Manchester.

KEIGHLEY.—September 5th.—For the supply of cylinders for reservoir works, for the corporation.—Mr. M. R. Barrett, engineer, Town Hall.

Roads.

PERTHSHIRE.—September 5th—14th.—For work of road construction, for the Eastern District Committee.—Mr. G. Wyllie, road surveyor, Blairgowrie.

LLANDUDNO.—September 7th.—For work of road construction, for the Joint Committee.—Mr. W. T. Ward, engineer, Town Hall, Llandudno.

SUNBURY.—September 7th.—For the reconstruction of two roads, for the urban district council.—Mr. H. F. Coales, engineer, Council Offices, Sunbury-on-Thames.

SOUTHAMPTON.—September 7th.—For the execution of private street works, for the corporation.—Borough Engineer.

ITCHEN.—September 7th.—For executing works in certain roads, for the urban district council.—Mr. T. A. Collingwood, surveyor.

REIGATE.—September 7th.—For the supply of road materials, for the corporation.—Mr. F. T. Clayton, borough surveyor.

ILFORD.—September 7th.—For making up certain roads, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

DEVIZES.—September 7th.—For scarifying and steam rolling, for the rural district council.—Mr. S. W. Saunders, surveyor.

STEYNING EAST.—September 7th.—For the supply of 360 tons of 2-in. granite, and 100 tons of granite chippings, for the rural district council.—Mr. G. W. Warr, surveyor.

LEEDS.—September 7th.—For laying tramway track in certain roads, for the corporation.—Mr. J. B. Hamilton, general manager of tramways, Town Hall.

BRIGHTON.—September 8th.—For the supply of dressed kerb and channel, for the corporation.—Borough Surveyor.

HORNSEY.—September 8th.—For grading and tarpaving a school playground, for the Education Committee.—Engineer and Surveyor, Town Hall, Hornsey, N.

CLUTTON.—September 8th.—For steam rolling and scarifying, for the rural district council.—Mr. J. S. Drury, clerk, Temple Cloud, Bristol.

WILLESDEN.—September 8th.—For the supply of Norway or other granite, for the urban district council.—Mr. O. Claude Robson, engineer, Municipal Offices, Dyne-road, Kilburn, N.W.

ROCHDALE.—September 9th.—For making up certain streets, for the corporation.—Borough Surveyor.

BATH.—September 9th.—For making good certain private streets, for the corporation.—Mr. C. R. Fortune, city surveyor.

BARROW.—September 9th.—For road construction, for the corporation.—Borough Engineer.

BURY (Lancs).—September 12th.—For private street works, for the corporation.—Borough Engineer and Surveyor.

BRITON FERRY.—September 12th.—For the supply of broken granite or basalt road metalling, delivered in quantities required, for the urban district council.—Mr. H. Alex. Clarke, engineer and surveyor.

BEDFORD.—September 12th.—For the supply of broken granite, ironstone slag, and ironstone slag macadam, for the corporation.—Mr. N. Greenshields, borough engineer and surveyor.

DERBYSHIRE.—September 14th.—For roadways and pathways at Walton sanatorium, for the county council.—Messrs. W. H. Ward, architects, Paradise-street, Birmingham.

LEWISHAM.—September 15th.—For work of street construction, for the borough council.—Borough Surveyor.

HAMBLEDON.—September 15th.—For making up a private street, for the rural district council.—Mr. S. B. Hasell, surveyor, High-street, Bramley.

STEVENAGE.—September 21st.—For the supply of 800 tons of clean chippings and dust, and broken Guernsey, Leicester, or other granite, for the urban district council.—Mr. W. O. Times, clerk.

RHONDDA.—September 22nd.—For making up certain streets, for the urban district council.—Mr. E. H. Barber, engineer and surveyor, Pentre.

CROYDON.—September 24th.—For making up a certain road, for the rural district council.—Mr. R. M. Chart, surveyor.

LAMBETH.—September 24th.—For the construction of road foundations, for the borough council.—Mr. Henry Edwards, borough engineer.

GATESHEAD.—September 29th.—For paving work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

TANGIER.—October 3rd.—For road construction, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

Sanitary.

HEXHAM.—September 5th.—For the execution of a scheme of main drainage and sewage disposal, for the rural district council.—Messrs. D. Balfour & Son, 3 St. Nicholas-buildings, Newcastle-on-Tyne.

ST. ALBANS.—September 5th.—For works of sewerage, consisting of pipe sewers, manholes, flushing apparatus, gullies, and connections, for the corporation.—Mr. H. Humphreys, engineer, 28 Victoria-street, Westminster, London, S.W.

MOTTRAM.—September 5th.—For cleansing and emptying closets and ashpits, for the urban district council.—Mr. S. Hudson, inspector.

WILLINGTON.—September 5th.—For the construction of sludge beds and drainage, for the urban district council.—Mr. J. H. Gardner, surveyor.

ITCHEN.—September 7th.—For work of surface-water drainage, for the urban district council.—Mr. T. A. Collingwood, surveyor, Woolston.

WHICKHAM.—September 7th.—For the construction of [illegible] and [illegible] for the urban district council.—Mr. J. B. Renton, surveyor.

STONE.—September 14th, 21st.—For the construction of [illegible] and sewage disposal works for the rural district council.—Messrs. Chapman & Snape, [illegible], Nottingham-place, Lond.

FARLINGTON.—[illegible] and laying about 760 yds. of 9-in. glazed stoneware socket sewer, at Longworth, for the rural district council.—Mr. H. Gale, Water [illegible], Farnborough, Berks.

[illegible].—September 9th.—For carrying work in connection with the [illegible] sewer.—Mr. W. T. Wood, surveyor.

SLAYBON.—September 9th.—For the removal and [illegible] the [illegible] refuse, for the urban district council.—Mr. R. Bagnall, Council Offices.

SHIELDS.—September 9th.—For constructing works in the [illegible] drains, for the urban district council.—Messrs. W. Paterson & J. M. Nicholson, 19 [illegible], Newcastle-on-Tyne.

HAVANT.—September 9th.—For the removal of earth-closet soil, ashes, and house refuse, for the rural district council.—The Surveyor.

KIRKCALDY.—September 9th.—For the construction of two culverts, for the corporation.—Burgh Surveyor.

RHYMNEY VALLEY.—September 9th.—For the construction of brick [illegible] sewer, about 10 miles long, for the Sewerage Board.—Messrs. Wilcox & Raikes, 9 Victoria-street, Westminster, and Mr. T. J. Thomas, 36 High-street, Bargoed, Glam.

CHEADLE.—September 10th.—For the enlargement and extension of the sewage disposal works, for the rural district council.—Mr. F. T. Inskip, surveyor, Brook House, Cheadle, Staffs.

COCKERMOUTH.—September 12th.—For laying 2,000 yds. of sewers and constructing manholes and flushing chambers, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

DOWNPATRICK.—September 12th.—For the construction of a sewer, for the rural district council.—Mr. R. L. Morrow, clerk.

BANBURY.—October 3rd.—For the construction of about 1 mile of 18-in., 15-in., and 9-in. cast-iron and stoneware pipe sewers, with manholes, storm overflow chamber, erection of engine-house, refuse destructor-house, and other works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Miscellaneous.

WHICKHAM.—September 7th.—For laying out a proposed cemetery and garden house, for the urban district council.—Mr. J. B. Renton, surveyor.

KINGSTON-UPON-THAMES.—September 9th.—For the construction of a movable flooring over swimming bath, for the corporation.—Mr. R. Hampton Clucas, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

EPSOM.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor.

Guernsey.—J. Mowlem & Co., Westminster, S.W.
Quenast.—London Granite Company, Great Tower-street, E.C.
Jersey.—Croft Granite Company, Leicestershire.
To Various Stations in the District.—Prices for broken granite and chippings, from 16s. 4d. to 11s. 3d.

GWYRFAI.—For the erection of thirty-six workmen's dwellings, for the rural district council.—Mr. J. W. Thomas, surveyor, Carnarvon:—

J. Roberts, Carnarvon	£9,842
Jones Brothers, Carnarvon	9,462
R. & H. Hughes, Bethesda	8,740
Roberts & Williams, Bethesda	7,942
Williams Brothers, Waenfawr*	6,977

HARTISMERE.—For the erection of dwellings at Eye, Suffolk, for the rural district council.—Messrs. Winkworth & Winkworth, Ipswich, architects.

BACTON.

Theobald & Sons, Needham Market	£470
F. Hogg & Son, Bury St. Edmunds	465
H. A. Andrews, Diss	458
R. Scott, Old Newton, Suffolk	407
J. W. Trudgett, Colchester	394
Howes Brothers, Bury St. Edmunds‡	381

WOLFEHAM.

Theobald & Sons, Needham Market	£490
H. A. Andrews, Diss	461
F. Hogg & Son, Bury St. Edmunds	458
R. Scott, Old Newton, Suffolk	447
Howes Brothers, Bury St. Edmunds‡	405
J. W. Trudgett, Colchester	402

WYVERSTONE.

Theobald & Sons, Needham Market	£485
F. Hogg & Son, Bury St. Edmunds	465
H. A. Andrews, Diss	463
R. Scott, Old Newton, Suffolk	407
J. W. Trudgett, Colchester	402
Howes Brothers, Bury St. Edmunds	388

THORNDON.

Theobald & Sons, Needham Market	£500
H. A. Andrews, Diss	461
R. Scott, Old Newton, Suffolk	447
Howes Brothers, Bury St. Edmunds‡	424
J. W. Trudgett, Colchester	402

THRANDESTON.

Theobald & Sons, Needham Market	£480
H. A. Andrews, Diss	461
R. Scott, Old Newton, Suffolk	447
Howes Brothers, Bury St. Edmunds‡	405
J. W. Trudgett, Colchester	402

HASTINGS.—For the supply and laying of about 2,600 sq. yds. of limestone tar-paving in various streets in the borough, for the corporation.—Mr. P. H. Palmer, borough engineer:—

J. Wainwright & Co., Limited, Shepton Mallet, 1s. 11½d. per

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

19. Institution of Municipal and County Engineers: Meeting at Cleethorpes.
26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

OCTOBER.

24. Royal Sanitary Institute: Meeting at York. Discussion on "Biological Treatment of the York Sewage."

APPOINTMENTS WANTED.

Prepaid *Advertisements under this heading are inserted at the rate of* One Penny *per word, with a minimum charge of 2s.* Three *consecutive insertions given for the price of* Two.

SURVEYOR'S ASSISTANT, 22, Stud.I.M. & Cy.E., surveying, levelling, preparation of plans and sections, keeping of all books, general office work. Low wage where experience can be gained.—Apply Box 1,462, office of The Surveyor, 24 Bridelane, Fleet-street, E.C. (1,893)

TENDERS WANTED.

CORPORATION OF BANBURY.
BANBURY SEWERAGE AND SEWAGE DISPOSAL.

The Corporation of Banbury invites Tenders for the construction of about 1 mile of 18-in., 15-in., 12-in. and 9-in. Cast-iron and Stoneware Pipe Sewers, together with Manholes and Storm Overflow Chamber, the erection of Engine-house, Refuse Destructor House and Chimney Stack, the construction of Screening Chambers, Pump Well, Storm Tanks, the provision and laying of about 1,200 yds. of 15-in. Cast-iron Rising Main, and of other works incidental to the scheme.

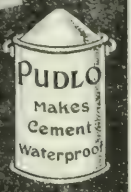
Plans and Specification may be seen at the office of the Engineers, Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham, from whom copies of the Bills of Quantities and Form of Tender may be obtained on or after the 7th day of September on payment of a deposit of Five Guineas, which will only be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelopes supplied, and endorsed "Banbury Sewerage. Contract No. 1," to be delivered at my office not later than 12 o'clock noon on the 3rd day of October, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)
ARTHUR STOCKTON (Solicitor),
(1,891) Town Clerk.

PUDLO



Makes Cement Waterproof

FOR DAMP WALLS, FLOODED CELLARS AND FLAT ROOFS.

Cannot deteriorate. Adds to the strength. Does not injure cement

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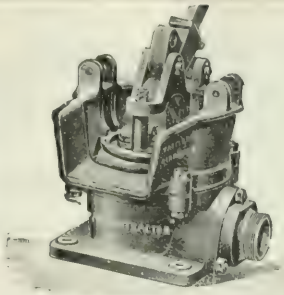

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ESTD. 1804.

STEREOPHAGUS PUMPS.

The most economical method for the automatic drainage of flat districts, basements, and isolated buildings, for the transport of sludge, and for all cases where liquids containing fibrous matter are to be dealt with.

Until further notice all enquiries may be addressed

THE STEREOPHAGUS PUMP & ENGINEERING CO., LTD.,
39 Albany Buildings,
Victoria Street, S.W.

EXHIBITION

OF ROAD MAKING MATERIALS AND APPLIANCES
AND
MUNICIPAL ENGINEERING REQUISITES.

Firms desiring to Exhibit should apply without delay to
C. S. MASON, 24 BRIDE LANE, FLEET STREET, E.C.,
of whom all information can be obtained.

From April 13th **OLYMPIA** *to April 25th, 1915.*

BRITON FERRY URBAN DISTRICT COUNCIL.

TENDERS FOR BROKEN GRANITE, &c.

The Urban District Council of Briton Ferry invite Tenders for the supply of Broken Granite or Beach River Metalling delivered in particulars required.

Tender Form and Specification can be obtained upon application to the undersigned.

Sealed Tenders, endorsed "Tender for Granite," to be delivered at my office on or before Saturday, the [illegible] day of September, 1914.

The Council do not hold themselves bound to accept the lowest or any Tender.

H. ALEX. CLARKE,
Engineer and Surveyor.

Council Office,
Briton Ferry.

August 31, 1914. (1,890)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of vacancies. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WANTED, for three months, the services of a thoroughly qualified Engineering and Surveying Assistant. Only those fully acquainted with the use of the theodolite and the calculating of quantities of earthworks, &c., and having practical experience in the work of carrying out and construction of roads and railways need apply. Salary three guineas per week. Apply Box 1,459, office of THE SURVEYOR, 21 Bridewell Place, Fleet Street, E.C. (1,887)

COUNTY BOROUGH OF SWANSEA.

APPOINTMENT OF BOROUGH SURVEYOR.

The Corporation of Swansea invite applications from duly qualified Surveyors under 45 years of age for the appointment of Borough Surveyor.

Commencing salary £500 per annum.

Applications, stating age, qualifications, and experience, accompanied by copies of not more than three recent testimonials (which will not be returned), endorsed "Borough Surveyor," to be sent to me the undersigned (from whom particulars of the duties of the office can be obtained) not later than 12 o'clock noon on Tuesday, the 15th day of September, 1914.

Canvassing, either directly or indirectly, is strongly objected to, and is strictly prohibited, and any candidate pursuing the practice will be disqualified.

H. LANG COATH,
Town Clerk.

Guildhall, Swansea.
August 21, 1914. (1,869)

AYLESBURY URBAN DISTRICT COUNCIL.

Applications are invited for the appointment of Temporary Surveyor's Assistant. Salary at the rate of £75 per annum. The person to be appointed must be a good Draughtsman and Surveyor, and possess practical knowledge of the work of a Municipal Engineer's Office.

Applications, stating age and experience, together with copies of three recent testimonials, must be sent to the undersigned not later than noon on Monday, September 14, 1914.

WM. HAROLD TAYLOR,
Engineer and Surveyor.

Town Hall,
Aylesbury. (1,888)

There is ONE

NONSLIP STONE

and ONE only.

THE HARD YORK NONSLIP STONE CO.,
(BROOKES LTD.,)
HEAD OFFICES: HALIFAX.

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DRAIN AND TUBE CLEARING MACHINES

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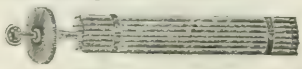

Also with the "FERRET" or other patent LOCKFAST JOINTS.

Cannot Slip the Thread or Unscrew.
Interchangeable Self-locking.

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IN USE BY EMINENT SANITARY EXPERTS EVERYWHERE.

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CAKEBREAD, ROBEY & CO., Caroba Works, WOOD GREEN, LONDON, N.

Telegraphic Address: "SPLENDOUR, LONDON." Telephone Numbers, Palmers Green, 635 & 636.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. SEPTEMBER 11, 1914. No. 1,182.

Minutes of Proceedings.

Harmonic Waves in Road Crusts.

In order that we may place before our readers some representative opinions of American engineers on the subject of harmonic waves in road crusts, we have reproduced elsewhere in the present issue a number of extracts from the report of a meeting of the American Society of Engineers held early this year. It has long been understood in this country that undulations in road crusts are caused by rhythmic vibrations of the wheels of vehicles on their springs, these vibrations being started by accidentally formed humps or depressions, or by similar humps and depressions due to local hardness or softness, or strength or weakness in the road crust or the subsoil. Under the conditions of fifteen years ago the effect of vehicles in causing a string of puddles or a succession of humps and hollows usually died out in a short distance, or, where it persisted for a considerable distance, was aided by the presence of hard and soft places, alternating, in the crust. Here the influence of rolling might have been traced, and it was, indeed, sometimes pointed out that on some roads the rollers used were much too heavy, and disturbed the subsoil unduly. Past experience, then, teaches us that one of the factors causing waving of a road surface is the occurrence of "accidental" humps or hollows, such as those caused by trenches made across the road, including, it may be remarked, trenches cut, or to be cut, for the purpose of ascertaining the thickness of the crust. The next question to be considered is to what extent do actual or potential waves caused by rolling result in serious waving of the surface. Potential waves may be caused by actual undulations in the road bed, or by alternating differences in the strength or solidity of the crust; and actual initial waving may be very rapidly increased at the edges by water scour outwards, the undulation then working back towards the middle of the road. It is certain that many engineers believe that initial waving due to rolling is very important. It may certainly be reduced by using a roller which can be gradually loaded up as the work proceeds, by adopting Mr. Reeves' proposal to use low-pressure rollers first and to consolidate with high-pressure rollers, and by cross rolling or slant rolling where the road is wide enough. Provided that Col. Crompton's three-axle roller can conveniently be managed in practice, it can hardly be doubted that it provides another remedy.

If, now, it be admitted that the initial waving due to rolling is fairly general and really the chief factor in producing waves, it cannot logically be argued that rhythmic beating of the road by motor vehicles with their own dominant period of vibration can be a generally accentuating factor—unless by an unlucky chance there are roads on which the wave lengths of the vehicles correspond with those of the initial waves. This correspondence is possible, and should not be altogether put out of consideration, but it is far from probable, and it is certain that it does not exist in the case of light motor vehicles or ordinary motor cars, the waves produced by these vehicles being shorter than the waves due to rolling. Next, however, we have to consider whether the initial waving may lead to a rhythmic thumping by motor vehicles, the period of vibration being that due to the initial waves—not being imposed by dominant qualities of the vehicles themselves. Where the wave lengths are long enough the waving may even be enhanced by a "pitching," in the nautical sense, of the vehicle as a whole, the time period being imposed by the initial waves. The probable truth, then, seems to be as follows: Accidental humps or hollows start vibrations of wheels and axles, and, on roads on which certain classes of vehicles pass in large numbers, there will be waving, the wave lengths being those imposed by this class of vehicles, dominant as regards the wave length. The two chief classes are, first, motor buses and vans of similar size and weight as regards unsprung weight and sizes of springs, and, secondly, the heavier classes of touring and private motor cars. The practical remedies are steadily to improve the roads as regards evenness of the road bed, regularity in crust thickness, segregation of material in the crust, and sufficiency of crust thickness. It is also advisable to avoid cross drains which, by making alternations of damp and dry parts of the road, may lead to wave formation. The last-named factor is more important, however, when taken in conjunction with the avoidance of initial waves due to rolling. As regards this the means already suggested may be employed, and at any rate one other factor must be considered. In rolling a road crust it is impossible to obtain the best results if the thickness of the crust varies sharply and frequently. On most old main roads it does. Therefore roads should be remade, the road bed being properly shaped and a sufficient and equal thickness of crust provided. The policy of improving the "surfaces" without carrying out work of this kind may satisfy a "demand," but it is a weak and wrong policy.

* * *

Recent Practice with Ultra-Violet Rays.

The possibilities of sterilisation of water by means of the ultra-violet rays have long been recognised. Comparatively large installations, some of them worked on a commercial scale, have proved the many advantages of the system. We have heard from time to time of the treatment being adopted for large institutions, and even for towns in France, but up to the present time there has been a remarkable scarcity of information as to the practical results of working and as to the cost of the process considered from the point of view of the water engineer. This lack of information as to the working of the process when applied upon a proper commercial scale has certainly delayed the

application of the system in many cases where it would apparently be desirable in this country, for we have no need to try experiments, neither do our water authorities show any great fondness for risking money in the cause of science. It is known that at Marommes les Rouen, France, 100,000 gallons of water per day have been treated; also Max von Recklinghausen, in an article which appeared in *Engineering News* of New York last year, mentioned a town supply in France of 1,700,000 gallons of water per day which was being sterilised by means of the ultra-violet rays. In America the first commercial undertaking for the purification of water by this method was that of Chicago, where bottled water was treated. About a year ago we were also told that the R. U. V. sterilisers in operation represented a total capacity of 10,000,000 gallons per day. All these matters have been dealt with in these pages, but we have again and again expressed our regret that full details were not forthcoming, and that the actual working cost of the process was not made sufficiently clear to justify the water engineer in recommending its adoption.

It is therefore interesting to learn that with characteristic courage and enterprise the city of Niagara Falls, New York, has decided to instal a large plant. The *Canadian Engineer* reports that a contract has been awarded to the R. U. V. Company, of New York, for the installation of thirty-five "Pistol" lamps for the sterilisation of water by means of the ultra-violet rays of the mercury vapour quartz lamp. This is the first municipal installation of the system in America. It is no small plant, the capacity of the filters with which the lamps are to be used being 16,000,000 gallons per day. The lamps will operate in banks of seven, and will be spaced 30 in. apart. Each bank will rest in a concrete channel 2 ft. wide by 3 ft. deep by 26 ft. long, and the water will pass through the channel at a rate that will allow an exposure of 30 seconds to the ultra-violet rays. The cost of the installation will be £4,120. Whether the Niagara Falls water authority intend to omit the whole or part of the present coagulating system is not stated, but it seems possible in view of the fact that filters are to be used, and that at Marommes les Rouen the water is filtered through sand at a rate of 50 ft. in twenty-four hours. Also it is one of the advantages of the system that the degree of treatment can be varied according to the quality of the water by having more or fewer lamps in operation at one time as the case may be. Again, it seems to be an established fact that with the ultra-violet rays treatment a much higher speed of preliminary filtration is possible than would be necessary for the production of potable water. It is essential that the water should be free from all small visible suspended matter, however, and the actual degree of the preliminary treatment required will probably be a matter of trial and error. The working costs of the process at Niagara Falls, and fuller information as to details, are matters for which we should wait with interest.

Main Roads in Middlesex.

The seventh annual report of the Highways Committee of the Middlesex County Council, which includes reports by Mr. H. T. Wakelam, M.Inst.C.E., the county engineer and surveyor, on the main roads and bridges of the county, is of special interest as giving some account of the steps which have been taken to meet modern traffic conditions in an area of peculiar difficulty. In dealing with the state of the main and subsidised roads, Mr. Wakelam emphasises the fact that, prior to the introduction of the motor car, ordinary water-bound macadam road surfaces were generally found sufficient to meet the needs of the traffic then on the roads. With the introduction of mechanical traction on a considerable scale, however, signs of surface deterioration soon made their appearance, and the intolerable dust nuisance arose. Attempts were made at first to meet this nuisance by means of chemical dust layers, but the method of tar-painting ultimately prevailed. For some years in Middlesex an annual application of this material was usually found sufficient to keep a water-bound road in good order. But with the constantly increasing weight of vehicles, and, above all, with the introduction of the fast travelling motor omnibus, it was found that the ordinary water-bound roads were being subjected to a certain process of wholesale destruction. To use Mr. Wakelam's own words, no county in Great Britain has suffered more in this connection than Middlesex. Roads which two or three years ago were of a very high standard are to-day, owing to motor omnibus traffic, little better than the district roads of a poor urban district—despite the amount of money and materials that have been annually expended upon them. The wear and tear by motor omnibuses on water-bound metalling has become so great that it has become absolutely necessary, both from a financial and practical point of view, to discard the use of water-bound granite, and to lay surfacing material of a more permanent character. As an example it may be mentioned that during the year covered by the report now under consideration the whole length of the main Bath road maintained by the county council has been reconstructed with Trinidad asphaltic macadam. Further, a bituminous surfacing has also been commenced along the St. Albans road, and will be continued throughout the whole length of that thoroughfare so far as it is maintainable by the county. With these facts before us, it is not surprising to learn that the cost of the upkeep of both main and subsidised roads in Middlesex is, and is likely to be, on the increase. But when the peculiar conditions of an area situated in such close proximity to the Metropolis are considered, it might reasonably be expected that the council would be treated with exceptional generosity in the matter of Exchequer grants. In the past, however, this has not been the case; but when the scheme of road classification contemplated by the Road Board is brought into operation it is hoped that the county finances may benefit to a very considerable extent.

Highway Administration in Ontario.

The importance of the public highway as a means of communication for any community has become so much enhanced in recent years that the problem of providing good roads has thrust itself to the fore in every part of the world. We have before us the report of the Public Roads and Highways Commission of Ontario which was appointed last year to make a preliminary survey of the question as it affects that province, a volume which, although it naturally deals principally with local conditions, contains much that is of wider interest. The main conditions with which the commissioners were faced are radically different from those which obtain in England, and may be summed up as an enormous area, a sparse population, and monetary resources which, while not meagre, have definite limits. In these circumstances the suggestion that the province should embark upon a definite fifteen years policy, and establish a form of organisation carefully designed to be simple and flexible, and to fit itself into the development of the future, is undoubtedly a wise one. The general recommendations of the commission are based upon the assumption that the mechanically propelled vehicle has come to stay, and upon a conviction that the successful solution

of the problem of good roads in no small measure depends upon a recognition of this fact. This leads to the general conclusions that the cities must co-operate with the country districts in procuring good roads, and that the problem is inseparable from questions of taxation. As regards administration, the commissioners realise the importance of maintaining as far as possible local control in order that local interest may be kept thoroughly live. On the other hand, some form of central control is necessary, and they accordingly suggest the establishment of a central road department working in harmony with local authorities, with the idea that upon the latter shall rest the responsibility of producing and maintaining roads necessary for the traffic needs of the people. Regarding the taxation of motor vehicles, the commissioners, in our opinion, take a very sound line in declining to recognise that such a tax should be levied as a punitive measure. Every user of a highway contributes to its destruction, and if any attempt is made to graduate taxation to the amount or mode of user, endless difficulties will arise. It must not be taken, however, that we are opposed to the taxation of such vehicles. In our opinion the automobile may fairly be regarded as a form of wealth which is proper for taxation, and the amount raised may appropriately be used for road improvement. The importance of the work of the commissioners and its influence on the future development and prosperity of Ontario can hardly be exaggerated, and it is to be hoped that the legislature will vigorously pursue a forward policy. There is more than a modicum of truth in the dictum of an American statesman that "you cannot increase the prosperity of a country as a whole without increasing its highway facilities."

* * *

For the Ambitious.

We have before us a copy of the printed form of application sent to candidates for the joint appointments of "Inspector of Nuisances and Surveyor, *cetera*," to the Borough of Okehampton, which was recently advertised. Our attention was first attracted to this appointment by the advertised scale of salary—namely, £50 a year as inspector of nuisances, and £30 as surveyor under the Public Health Acts, inspector of petroleum, &c., the whole to be increased by annual increments of £5 until a maximum of £100 is reached. The borough is, no doubt, a small one, but this is not a relevant consideration, inasmuch as the person appointed must give his whole time to the duties of the office, which include attendance at all the meetings of the council and committees, most of which are held in the evening. The fact remains, therefore, that the council seek to obtain for £80 a year the whole-time service of an officer who, in addition to holding a qualifying certificate as inspector of nuisances, will also have, among a multiplicity of other duties, to "prepare all plans and specifications in connection with works of sewage disposal, markets, street improvement and widening, and water supply, and superintend the carrying out of such works." These duties can only be properly discharged by a professional man with an adequate technical training, and we leave it to the council to ask themselves whether in the circumstances, if they wish to obtain a capable officer, they should not either offer a larger salary, or, if this is impracticable, allow the person appointed to eke out a living wage by means of such private practice as he can obtain. Apart from any question of salary, however, the form of application merits comment in two particulars. In the first place it is stated that the officer "will act under the medical officer of health." This condition is not expressed as being subject to any qualification, and therefore presumably applies not only to the officer in his capacity as inspector of nuisances, but also when he is superintending, say, the carrying out of street works, or preparing plans and specifications for works of water supply. Intending candidates should take note of this *before sending in their applications*; for the second point to be noted is that every applicant has to sign an undertaking to accept office, if elected, and once an application is sent in a candidate may be elected in his absence if the council see fit to do so. We should have thought that the condition that canvassing councillors, either directly or indirectly, will disqualify was superfluous.

* * *

Economy in Watering.

In another column will be found an article from the pen of Mr. Ernest H. Essex, Assoc.M.Inst.C.E., the engineer and surveyor to the Leyton Urban District Council, in which he describes the economies that have been effected in the street watering service of that district since the introduction of the Essex time recorder as an attachment to each van. The whole article affords an excellent illustration of the economies which result from thorough administration, systematic observation of possible sources of waste, and initiative and ingenuity in stopping them when found. The recorder is a simple instrument, and consists essentially of a card which is rotated by clockwork once in a period of twelve hours. Further description would be out of place here, but we may say that the device not only enables the surveyor to satisfy himself that each van has in fact delivered a prearranged number of loads during the day, and that these loads have been full ones, but also renders it possible for him to ascertain at a glance the times occupied in filling the van, travelling with a full load, distributing the water, travelling empty, and meals respectively. An inspection of the actual records on charts, which we reproduce, will show at once the clear and useful nature of the information which they afford. As regards the practical economic value of the recorder, it is sufficient to say that the inventor anticipates that in the district for which he is responsible its general use will result in a saving of about 2d. for every 1,000 gallons of water distributed.

* * *

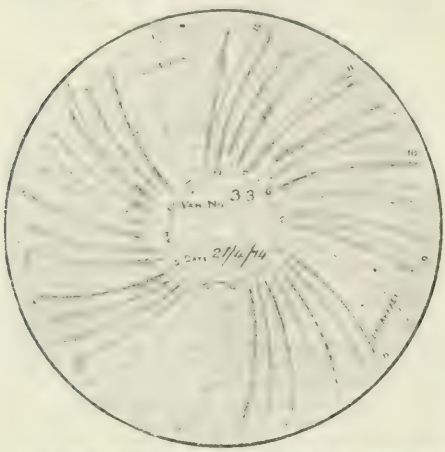
Wiltshire Main Roads.

In our issue of August 21st last we published a letter over the signature "One of the Ten," in which the writer took exception to some remarks which had been made by Mr. Docking, a member of the Wiltshire County Council, in discussing a recommendation that the county council should themselves undertake the maintenance and supervision of the whole of the main roads at present repaired under contract by the rural district councils. In commenting upon this letter we pointed out that we had no desire to criticise the recommendation in question, but that we did complain of the tone of Mr. Docking's speech, which bore the appearance of an attack upon the thirteen district surveyors concerned. Mr. Docking has since written a letter on the subject to the *Wiltshire Times*, which, in fairness to him we print at length in another column. It is satisfactory to observe that Mr. Docking states in terms that he blames neither the surveyors nor the roadmen, but that his attack is directed against what he describes as "the muddle-headed and stupid system which perpetuates and tolerates" the present state of affairs. This admission should result in the removal of any personal element from the discussion. On the question of policy, however, Mr. Docking and "One of the Ten" remain at variance, and we are afraid that we are not in a position at present to judge between them.

The Science of Street Watering.

By ERNEST H. ESSEX, Assoc. M.Inst.C.E., Engineer and Surveyor to the Leyton Urban District Council.

In an article on the subject which I wrote last year I expressed the opinion that each water van (380 gallons capacity) should distribute twenty-four loads per day over 6 miles of roadway watered once, i.e., 9,000 gallons in 88,000 super. yds. of carriage way—say, 10 yds. to the gallon. At that time I was getting only seventeen vans loads per day, and in consequence advocated the insertion of a new clause in the street watering contract to ensure the distribution of the 9,000 gallons required daily. The following table shows the comparison of last year's working under that clause compared with that of the three previous years.



This chart shows that the carman has distributed thirty loads, no doubt under the wrong impression that the greatest number of loads would obtain him the highest commendation. On inspection of the van it was found that a number of the holes in the box sprinkler had been opened out, some of them to nearly ¼ in. in diameter. The chart shows short loads, particularly at 10.30, 2.40, 3 o'clock and 4 o'clock. It also shows delay in filling at the standposts at 9.35, 10 o'clock, 11 o'clock, 2.30 and 3.40. This delay may have been due to another van using the same post, and could be remedied either by re-organisation or the provision of a new standpost.

This chart shows that time was lost from 7.40 to 9.15 through the horse casting a shoe and having to be taken to the farrier. The carman made up for this by taking short time in the dinner hour and by pushing on with his job, completing his twenty-four loads and getting back to the yard at 4.25. At 10.25 he had to wait five minutes at the post to fill, no doubt waiting for another van using the same post. At 10.15 he had to travel five minutes to another road to empty, and in the ordinary way this load would probably have been returned as a load on each of the two roads watered.

STREET WATERING.—TABLE SHOWING COST OF DISTRIBUTION FOR PAST FOUR YEARS.

Season.	Cartage.		No. of cart days.	Quantity of water used. Gallons.	No. of 380 gals. Van loads.	Average loads per day.	Average gals. per day.	Cost of distributing 1,000 gallons.					Actual saving for the season.
	Rate per day.	Cost per annum.						Total cost.	Saving compared with 1910.	Increase in tender prices.	Supervision under contract.	Actual saving.	
	s. d.	£						d.	d.	d.	d.	d.	£
1910	9 6 9 4 9 6	1,353	2,847	18,349,100	48,288	17	6,460	17·70	—	-	—	—	—
1911	9 7 9 6 9 8	1,670	3,475	24,041,400	63,645	17·5	6,450	17·47	0·43	0·25	—	0·68	6
1912	10 8 10 8 10 6	1,349	2,524	16,445,000	43,278	17·1	6,498	19·50	—	2·15	-	0·25	3
1913	12 3 12 4 12 4	1,287	2,002	18,060,300	47,527	22·8	8,664	17·10	0·60	1·96	2·50	2·56	193

The effect of the new clause was to increase the tender prices for cartage by 1s. 6d. per day for supervision; but even then there was an actual saving in distribution last year compared with 1910 of 2·56d. per 1,000 gallons, or £193 for the season. This year we are attempting also to retrieve the 1s. 6d. per day charged for supervision (equivalent to 2d. per 1,000 gallons distributed) by attaching time recorders to the water vans, and reverting to the old clause in the contract. The charts reproduced herewith will show that adequate supervision is ensured, and that the horses and men will not be overtaxed to discharge the twenty-four loads per day required. This will mean a further annual saving of at least £150, and it may be noticed that it has taken three years to arrive at the best means of effecting this saving, involving the expenditure of a considerable amount of time and application on the part of the whole of my staff.

The statistics connected with this subject are, I am sure, worthy of consideration at the hands of every municipal surveyor. I consider $\frac{1}{50}$ in. depth of water, or 10 super. yds. to the gallon, for each time of watering, the maximum required for granite or ballast water-bound roads on a dry day. The width of the road does not enter into consideration except so far as the total number of gallons required to cover the road in question. I certainly think less than this is sufficient on well-paved roads, but I do not place much reliance upon variations in the jets to be controlled by the carman. The table on p. 325 as to the rate of speed and travel of van will make this clear.

The Warwick sprinkler, a type which has been largely supplied to municipal authorities, is sent out with a variable spread, by which the carman can empty his van in 6, 4½ or 3 minutes respectively, but it will be noticed that to distribute not more than $\frac{1}{50}$ in. with the fine spread he would have to travel 3½ miles per hour, with a medium spread 6¼ miles

per hour, and with the heavy spread at the impossible rate of 9 miles per hour. It is the indiscriminate use of such vans that gives rise to most of the complaints as to excessive watering of carriageways, and if all water vans were fitted with a time recorder the head of a department could see for himself when the men were emptying their vans too quickly. In my district I have altered all my sprinklers to empty in not less than 10 minutes, which gives a rate of travel of 2½ miles per h.m., corresponding with the old type rectangular vans, and the men are told to travel more slowly if the weather is exceptionally hot. Although the tendency is to travel about 3 miles per hour, I very seldom need to call upon them to reduce speed for the efficient watering of my roads. A high pressure or any form of rotary sprinkler is, of course, capable of adjustment to vary the rate of discharge to suit the rate of travel.

THE ESSEX TIME RECORDER.

The objective of this recorder is to satisfy the municipal surveyor, or other person responsible for the proper watering of town streets and roads, that each van has distributed a certain number of loads per day, that those loads have been full vanloads, and that the times set travelling to and fro between standposts and roads to be watered has in no case been excessive owing to the unsuitable position of any standpost.

The recorder consists of a card rotated once in twelve hours by a simple clockwork arrangement with a float inside the water van partially rotating a rod on the top of the van, to the end of which is attached a flat spring arm carrying a pencil which records on the cards.

A reproduction of the charts obtained is shown, and the simplicity of the attachment speaks for itself. It is impossible to travel full or empty and produce a thin lateral line on the chart; on the other hand, a thin lateral line is recorded on the chart as soon as the van stops moving. The thick line recorded when emptying is due to the movement of the water in the van when travelling. If the van is emptied while standing (e.g., to flush a gully or drain) such emptying will be recorded by a thin radial line similar to that produced in filling.

Description of van	Capacity.	Time emptying.	Discharge per minute.	Width of spread.	Area to be covered by one gallon.	Calculated rate of travel.	Area covered per minute.
	galls.	mins	galls	yds.	sq. yds	m.p.h.	sq. yds.
Ordinary type rectangular fitted with 12 No. 8 Cantly's jets	120	9	14	6	10	2½	140
Warwick patent sprinkler	145	6	24	7	10	3½	240
	—	12	111	6	10	6½	1,110
	—	3	148	5·6	10	9	1,480
	—	6	50	5	10	2½	500
Electrically propelled van	2,000	12	176	10	10	6	1,760

A depth of water equal to 1·4 in. represents 1 gallon to 10 super. yards.

Association of Managers of Sewage Disposal Works. The meeting of this body which it had been arranged to hold at Huddersfield on September 26th has been postponed indefinitely on account of the war.

Devonport's New Motor Fire Engine.—The Corporation of Devonport have recently acquired a powerful new motor fire engine. The engine is petrol driven, of the Merryweather "Hatfield" type. It develops 60-b.h.p., and the pump is capable of delivering 350 gallons a minute. A 45-ft. detachable fire escape is carried, and towing arrangements are provided for drawing a "Gem" pattern horse draught steam fire engine which was supplied by the same makers and has been in service for fourteen years.

Louvain Town Hall.—Photographs of Louvain, after the sacking of the city, have just reached London. While bearing out the reports of the terrible nature of the German outrage, all lovers of the beautiful will be delighted to hear that the famous town hall has almost, if not entirely, escaped injury. It has already been reported that the Germans declared they had spared some of the historic architecture of the town, and one picture showing a group of Germans posed for their portraits in front of the town hall would seem to indicate (says a news agency) that they were specially desirous of emphasising this fact. Otherwise, however, the devastating nature of the German revenge is only too apparent.

EXPERIENCE OF RECENT METHODS OF ROAD CONSTRUCTION IN LIVERPOOL.

By JOHN A. BRODIE, M.INST.C.E.,
City Engineer.

The most marked development in the character of street traffic in the Liverpool district during the past year has been the continued increase in the volume of heavy motor traffic to and from the docks and warehouses and the manufacturing districts of Lancashire.

For this traffic, as well as for ordinary motor traffic, the use of pitch-grouted macadam in the outer areas of the city, as adopted some years ago in Liverpool, has continued to give satisfactory results, and up to the present time is adequate to meet the demand made upon it in marked contrast with the ordinary water-bound macadam roads on heavy traffic lines which have not yet been reconstructed. This statement is to be taken as applying only to roads in the outer districts, where the traffic, although in some cases heavy, is not dense; in the central area, and especially in the immediate neighbourhood of the docks, where the traffic is congested and exceptionally heavy, exceeding, in some cases, 500,000 tons per yard width per annum, no pavement has been found to compare from the point of view of economy with granite setts on a Portland cement concrete foundation.

The area of pitch macadam laid during the past year amounts to about 90,000 sq. yds., bringing the total up to about 450,000 sq. yds. These figures include a considerable area of old boulder-paved streets over which a 3-in. layer of pitch macadam has been laid. Under a large volume of light motor and carriage traffic, amounting to 120,000 tons per yard width per annum, a life of at least twelve years without repair may be expected from pitch macadam; but particulars are not yet available to enable an accurate estimate to be formed as to the probable life of the pavement under heavy motor traffic.

The use of softwood pavement in preference to stone setts in the business and shopping areas of the city, where a silent pavement is desirable, is receiving attention, and during the past year several streets have been so paved with satisfactory results. The Liverpool specifications of pitch macadam and softwood pavement are attached.

SPECIFICATION FOR PITCH MACADAM.

Upon a 10-in. hand-pitched foundation, laid and consolidated in accordance with the fourth-class specification (for water-bound macadam), a layer of dry macadam of 2½-in. gauge stones, similar in quality to that used for water-bound macadam, shall be spread evenly to a depth of about 3½ in. (before consolidation). This layer, after being rolled with a light steam roller, shall be grouted with a hot mixture of pitch and creosote oil prepared in accordance with the specification below, and again rolled while hot until the mass is thoroughly consolidated. A second layer of similar macadam of 1½-in. gauge stones, 3 in. deep, shall then be laid, preferably while the lower layer is still hot. After being rolled dry, it shall be grouted in a similar manner with the pitch mixture, and again rolled until the whole is consolidated. The surface shall be finished off with a sprinkling of dry granite chippings. The road shall be laid to an approximately circular camber, with a crossfall from crown to channel of 1 in 48.

Specification for Pitch Grouting.

The pitch mixture used for grouting shall consist of coal-tar pitch and creosote oil supplied to the specifications given below, and boiled together in a

tank in the proportions of, approximately, 70 gallons of coal-tar to 1 ton of pitch, a temperature of from 250 deg. to 300 deg. Fahr. being attained. The proper consistency shall be obtained by applying the following rough tests: A small sample of the mixture, when cooled to a temperature of 60 deg. Fahr., shall stretch at least 3 ft. without breaking, the threads pulling out very fine. It shall also be found that a sample of about 1 ft. long, lifting [illegible] on a hard surface, spread showing any sign of cracking. After leaving the boiler, and immediately before being put on the road, an equal quantity of fine sharp sand, heated to 400 deg. Fahr., shall be added to the pitch mixture, which shall then be kept continually stirred until spread.

Specifications for Materials.

Macadam.—The macadam shall be of granite or trap rock from the quarries of North Wales, or from other approved quarries having a similar class of rock. It shall be carefully broken into cubical form so as to be capable of passing through the specified gauge in any direction. It shall be cleanly riddled to free it from dust, and all flat slatey fragments shall be picked out before shipment. 2½-in. macadam shall pass through a 2¼-in. ring and be held by a 2-in. ring. 1½-in. macadam shall pass through a 1½-in. ring and be held by a 1-in. ring.

Special Coal-tar Pitch.—(1) The pitch shall yield no matter volatile below 270 deg. Cent. when subjected to dry distillation, and its total volatile organic matter shall not fall below 30 per cent. (2) It shall not contain more than 80 per cent of its weight of matter insoluble in petroleum spirit of 0·700 specific gravity (boiling point not more than 90 deg. Cent.), and must be free from extraneous matter, such as sand and grit. (3) It must twist fairly after immersion for two minutes in water at 60 deg. Cent., but not under 55 deg. Cent.

Special Creosote Oil.—(1) The oil supplied shall be obtained exclusively by the distillation of coal-tar, and shall not contain any portion of the distillate obtained below 240 deg. Cent. None of it shall redistil below 240 deg. Cent. (2) The oil as obtained by distillation of coal-tar shall not be treated in any way, either by the addition of any coal-tar product, or by the extraction of any of its constituents, excepting such extraction as may be necessary to comply with clause 3. It shall contain no moisture. It shall contain no solid matter at 15 deg., and shall have a specific gravity of not less than 1·075 (taking water as 1·00 at 15 deg. Cent.). (3) It shall contain not less than 40 per cent of its constituents that do not distil over below 320 deg. Cent., and the 60 per cent which does distil over below 320 deg. Cent. shall contain 10 per cent of tar acids, to be extracted by soda of specific gravity 1·125 (water 1·00).

SPECIFICATION FOR WOOD PAVING.

The foundation shall consist of a concrete bed, as in the case of sett-paved streets, but the surface shall be carefully smoothed to the exact contour, which shall be approximately circular in section with a crossfall from crown to channel of 1 in 48. The pavement shall consist of blocks of Baltic, Swedish or Canadian red pine, thoroughly seasoned, sound throughout and free from sap, shakes, waney edges, or large knots. They shall be 9 in. long by 3 in. wide by 5 in. deep, the depth and width to be absolutely accurate. They shall be impregnated with creosote oil of approved quality to the extent of not less than 8 lb. per cub. ft. of timber. They shall be laid on the concrete bed without any intervening layer, in regular straight and properly-bonded courses with close joints. The channels shall be formed by longitudinal courses of blocks which shall be hand-dipped (hand and side) in a hot mixture of pitch and creosote oil, and an expansion joint 2 in. wide shall be formed along the kerb and filled with a properly tempered mixture of pitch and creosote oil, or other approved material. The joints of the pavement shall be grouted first with a hot composition of pitch and creosote oil, and afterwards with a grouting of cement and sharp sand, and finally covered off with small pea gravel.

A Glossary of Road Terms. By H. Percy Boulnois, M.Inst.C.E. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 2s.—Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he had made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before.—*Portsmouth Times.*

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Has not the Royal Sanitary Institute come to the front, as usual, at the right moment? Could anything be better than the proposal to form four Field Ambulance detachments under the War Department, and are there not a large number of members and associates of this institute who are exactly the right sort of men to enlist in this useful corps? Can we not confidently expect that the 750 men required for this noble work will be speedily forthcoming?

* * *

Is not the example set by the Royal Sanitary Institute worthy of being followed by other institutions and societies in various directions suitable for their members?

* * *

Would it be possible in some way to provide a badge for every man who has sought enlistment, and who, for some reason beyond his control, has been rejected? Would not such a badge protect him from the feeling of shame which every young, able-bodied man in this country must be beginning to feel when he appears in the streets or any other public place? Is it fair to the willing *man* that he should be mistaken for a *waster*?

* * *

How many men and women in this country are there who belong to the A.I.L.L. [All is Lost League]? And would it not be better if they read that most excellent advice in their Bible "Cast out fear," and at once become members of the C.O.F.B. [Cast Out Fear Brigade]?

* * *

Does it not seem difficult to realise that only a year ago the International Road Congress was held in London, and that men who are now engaged in fighting for their lives were amicably discussing technical points concerning roads which were to be used for commercial and civilised purposes? Where will the next International Road Congress in 1916 be held? Will it be held at Munich, as was arranged?

* * *

Can we not heartily say "Well done, Camberwell!" when we read that the council have been obliged to close all their lending libraries owing to the fact that the staffs have volunteered for active service? Can we not also be fully assured that the pockets of these brave and patriotic men will in no way suffer?

* * * *

Is it a fact that His Imperial Majesty the German Emperor is an honorary member of the Institution of Civil Engineers? And if he has not already resigned, will the council take steps at once to remove his name from the list? Are there any ordinary members or associate-members of this institution who are not naturalised English subjects, and still remain members?

* * *

Is it not gratifying to find that the Improved Wood Pavement Company, Limited, have resolved that no unmarried workmen who are eligible for service in the Army will be retained in their employment unless they are the main supports of relatives or other dependents? And will not this be the means of allaying a good deal of talk one hears of the employment in the public streets of men who, from their appearance, might be serving their country to better purpose?

* * *

Who could read the magnificently stirring address by the Prime Minister at the Mansion House without being deeply moved and impressed with the righteousness of our war with Germany? Will it not stir the heart of everyone calling himself a Britisher, and make him long to be "up and doing" for the defence of his country?

* * * *

Is not the courageous action of Mr. Charrington, in protesting against football matches being played while so many of our brave countrymen are laying down their lives in playing *the* game in France, to be highly praised? Is it not almost inconceivable that thousands of young, able-bodied men should be idly watching a football game when their only thoughts should be: What can I do to defend my country?

Modern Methods of Road Construction and Maintenance.

WHAT MUNICIPAL ENGINEERS ARE DOING (2).

In response to a request made a short time ago we have been favoured with a large number of communications from readers embodying the results of their experience with the methods of road construction which it has been necessary in recent years to introduce into their districts in consequence of changes in the character of the traffic. A first instalment of these appeared last week, and a second is given herewith.

ALTON, HANTS.

Mr. G. BERTRAM HARTLEY, F.S.I., Surveyor.

Tarmac, very satisfactory. Smith's tar-macadam, very satisfactory, three-coat work best for wide roads, mixed graded material with fine toppings preferable for narrow roads. Rocmac, satisfactory, more especially where trees overhang roads, or on steep gradients. Basalt, tarred previous to laying, or on Tarvia sub-binder, results but fair. Limestone, under similar conditions, very satisfactory. Clee Hill basalt, water-bound and tarred surface or on Rocmac binder, very satisfactory. Surface treatment: Distilled and crude tar, satisfactory, petroleum asphalts, poor results. Local materials: Flints, tarred previously to spreading, or surface tarred after, good results. Bargate rock, surface tarred, good results, gravel, surface tarred, indifferent results.

BRISTOL.

Mr. LESSEL S. MCKENZIE, ASSOC.M.INST.C.E., City Engineer.

In the heart of the city of Bristol practically all the roads are paved with wood, Australian and creosoted deal, the latter gradually taking the place of the hard wood. In the neighbourhood of the quays granite setts on concrete are mostly used.

The greater proportion of the macadam roads are coated with an excellent limestone obtained locally, and known as Blackrock. The stone being water-bound, and after being worn thoroughly hard, a coat of hot tar is applied, and for all the side roads and the roads in the residential parts this is found to be a very cheap and serviceable road, the limestone taking the tar exceedingly well and only requiring treatment every other year.

For main through roads, however, and roads along which motor 'buses travel, this construction is not good enough, and various other methods have been tried during the last four or five years. Sections of Tarmac, Pitchmac, Tarvia, granite or limestone grouted with Val de Travers asphalt, Roadoleum, Glutrin, Rocmac, and Vianex have been laid. The Tarmac stands very well, but as slag cannot be obtained in the district its use has not been extended. The Pitchmac has also stood well, but becomes very soft in the hot weather and very hard and rather inclined to be slippery in the cold weather. The Rocmac also seems to be an excellent binder, but the surface requires tarring to keep down the dust. Carpets of 1 in. thickness of Roadamant and Cormastic have been laid on the surface of a macadam road subject to motor 'bus traffic, and the former is standing the traffic the better. Carpets of Mexphalte 1 in. thick have also been laid on the surface of macadam roads. In one case a carpet formed of ¾-in. crushed granite, sand, Mexphalte and cement was laid in a road which carried the bulk of the heavy traffic to the Royal Show last year, and it stood it splendidly. Since then a section has been laid adjoining; in this no granite was used—simply sand, Mexphalte and cement. Sections also of 3-in. Mexphalte construction (in which the aggregate used was the local blackrock stone broken to a 1-in. gauge and under) have been laid on old road foundations, and in one case on a concrete foundation in place of wood paving, and these are all, so far, in very good condition, the only apparent defect being the inclination to slight waviness in the surface.

The boldest experiment carried out with this material is in Prince-street, a road adjoining the quays, along which very heavy traffic passes. This street was paved about ten years ago with granite setts on a concrete foundation, but the setts turned out weak and the surface became very uneven, though the concrete remained good. The area is about 4,000 yds. super., and to repave this out of revenue would have been a serious expenditure. The Highways Construction Company entered into a contract to lay a bottom coat of Mexphalte formed with ¾-in. local blackrock stone, 3 in. thick in the centre and running out to nothing at the channels, and then lay a 1-in. carpet over the whole, formed of Mexphalte, sand and cement, at 5s. per yard, with three years' guarantee. The work was carried out last September, and so far it is as good as the day it was laid, and looks like lasting many years. A good many cobble-paved streets have also been covered with a 1-in. carpet of Mexphalte, as being the cheapest method of dealing with them. This material is, of course, on its trial, but so far it appears to be sound, and if successful the corporation will put up a plant and carry out the work themselves.

A considerable quantity of tar-macadam has been laid by the corporation, but this has not really been a success on heavy traffic roads.

"Kleinplflaster" formed of 4-in. granite blocks, laid fan pattern, has been tried in connection with macadamised roads between heavy traffic. The blocks are laid by hand on the old macadam on a cushion of gravel or cement concrete and grouted with similar material. This method has been marked with great success. "Durax" has also been tried, but quite recently. This system has been laid in a street subject to very heavy traffic, and very good results are anticipated.

DUFFTOWN.

Mr. H. M'KAY, Burgh Surveyor.

Our roads within the burgh are ordinary macadam, with the exception of a part laid with Rocmac last year. Not only is the surface much cleaner than the ordinary macadam, but there is every indication that the life of the road will be very much longer.

GILLINGHAM.

Mr. J. L. REDFERN, Borough Surveyor.

For some years now it has been the practice to tar-paint the whole of the roads in the borough of Gillingham with dehydrated tar. This has extended the life of the roads, reduced the cost of scavenging and watering, and the annual cost of maintenance has not risen in spite of the growth of the town. Busy streets are treated every year; those with little traffic every other year. During last year 383,000 sq. yds. of roads were treated, at a cost just under 1d. per square yard, everything included.

Tar-macadam is used considerably, and has given excellent results. Durax paving has been laid between tramway margins and channels, and has worn well. A small quantity of pitch-grouting has been tried experimentally.

The Gillingham Council have purchased a new 10-h.p. four-seater four-cylinder Humber car for the use of the borough surveyor to replace one of another make which was purchased in November, 1906. The new car has cost £250, a credit of £30 being allowed for the old car.

The town council have adopted a forty-eight-hour working week for their workmen.

HAWICK.

Mr. CHARLES BROWN, Burgh Surveyor.

The main streets in our burgh from the Railway Bridge to the Tower Knowe, in all 10,000 sup. yds., was resurfaced with a bituminous covering 1½ in. thick (Bitromat), the contractors being Messrs. W. & G. Walker, Edinburgh. The work was completed in August of last year, and it has certainly improved the look of the town, which formerly was partly laid with whinstone paving and water-bound macadam.

The contract provides for the contractor keeping up the road for a period of ten years.

HELENSBURGH.

Mr. JAS. N. STIRLING, B.SC., ASSOC.M.INST.C.E., Burgh Surveyor.

Up to the year 1909 the streets of this burgh—extending to about 22 miles—were made entirely with

[illegible] The stone used was generally [illegible] and granite from quarries within a 35 miles [illegible] In 1907 the then surveyor, Mr. [illegible] Andrew, [illegible] the adoption of some more enduring material, and after some experiments the Rocmac roads were adopted as the standard road for the borough.

When the surface was good and hard Rocmac [illegible] and limestone dust binding were mixed together and rolled up from the bottom through 2½-in. [illegible] Where the road surface is not good the Rocmac solution and limestone are mixed with the metal as if for concrete, and the road rolled.

In this district the cost works out at from 6d. to 8d. per square yard more than for an ordinary water-bound macadam road. These figures apply to coatings of metal from 3 in. to 4½ in. thick, and the life [illegible] weighs put at 50 per cent more than that of an ordinary water-bound macadam road.

The Rocmac roads here have proved very free from mud, and in this wet climate that is of inestimable benefit; and when the Rocmac road which has been [illegible] opened up, the stones appear to have as sharp edges as when they were laid, showing that there is very little internal wear. On the other hand, there is some trouble from dust in the summer time, although the dust is never anything like so bad as with an ordinary water-bound road, and a good deal of trouble has been experienced from the appearance of potholes over the surfaces. An effort is to be made to get over the difficulty of the dust by spraying the surface with bitumen after the road has been down for some months; and a considerable saving in the number of potholes can be effected by patching the first few to appear, as after a time there does not seem to be just the same tendency for the potholes to appear.

HORSHAM.

Mr. R. Renwick, Surveyor.

During the past few years the following changes in our methods of road construction have been necessitated owing to the advent of motor traffic and mechanical traction.

The principal streets in the centre of the town have had their former hard stone surfaces replaced by tarred macadam, and other roads subject to through traffic, where formerly coated with flints are now metalled with hard stone, painted with refined coal-tar and dusted with clean granite chippings.

Flints are now only used on streets where the traffic is light and of a purely local nature, and here, again, tar-painting is resorted to with beneficial results, the wear of the surfaces being much reduced by this treatment, and also, and as a consequence, the nuisance from dust. Flint roads when tar-painted are dusted with a gravel in place of granite chippings, thus reducing the cost of the work considerably.

KINGSTON-UPON-THAMES.

Mr. R. Hampton Clucas, Borough Surveyor.

Owing to the changes in the character of traffic, Kingston-upon-Thames Corporation have been obliged to alter the method of construction of the principal roads. In place of water-bound macadam, wood paving (Swedish yellow deal), with concrete foundations, has been substituted in the following roads—viz., London-road, Eden-street, High-street, Portsmouth-road (part of), Surbiton-road, Richmond-road, Thames-street, Church-street and the Market-place, the cost of the work amounting to £18,000. The Local Government Board period sanctioned for the loan was ten years for wood blocks and twenty years for foundations.

Other methods of construction have been adopted on the Portsmouth-road, Surbiton-road and Eden-street—viz., Roadamant, 1 in. in thickness, on the existing water-bound road, the cost including alterations to gradients, &c., being £2,400. A portion of the Surbiton-road has been laid with Cormastic, 1 in. thick, on a water-bound road, at a cost of £300. Many lengths of roads have been constructed with granite and grouted with Plascom; one part of Eden-street has been laid over six years grouted with Plascom, which is subject to heavy traffic. Several lengths of roads have been constructed with tarred slag.

The majority of the above work has been laid two years, and in each case have given satisfactory results.

LURGAN.

Mr. Henry Shillington, M.A., M.E., Town Surveyor.

In this district we have had practically no experience of any of the latter-day methods of road rolling and maintenance other than the ordinary rolled, water-bound roadway. Therefore, having nothing new to tell, I shall, I think, be best advised to give briefly what my experience has suggested as most useful in laying the water-bound road by rolling.

I think most engineers are agreed that with a properly surfaced road it is a mistake to give too much camber—in short, more than will effectively direct surface water from the centre to the sides. But what constitutes "a properly surfaced road"? I believe it is a mere truism to say that we have yet to meet with a road surface that will content all users. Provide a smoothly tar-surfaced or asphalted road that would be the delight of the motorist to carry a traffic of heavily laden wagons, especially on a gradient of, say, 1 in 25, and what a protest would come from the equine control! I remember hearing the borough engineer of a large Black Country municipality say that the horses there generally objected to a gradient of more steepness than 1 in 50 on a tarred surface. I have of course seen, even on water-bound gradients, horses under light carriage traffic slip during the continuance of a long season of hot summer weather where the gradient was, say, 1 in 23, and these horses were fairly smoothly shod.

But it seems to me that one point that has been much neglected, even in ordinary road rolling, is the endeavour to suit the weight of the roller to the class of stone used. Does it not stand to reason that if a limestone metal coating—especially of the softer variety—is considered to require a 10-ton roller, a surfacing of greenstone or any of the very hard hornblende rocks should be given a much heavier pressure? In this district we have for metal basalt rock of the hardest type; our roller is about 12 tons weight, and as a consequence it is unable to consolidate the 2-in. metal we use, except by frequent passage backward and forward—also requiring the use of much more road scrapings to give anything like a smooth surface, and thus leaving each individual stone more subject to the impact of the roller and to consequent injury. If, however, we had a 20-ton roller, we could use, for blinding, the finer stone crushings, and then, with only a few roller passages, leave a roadway smooth enough for motor use, and yet affording a sufficient foothold for heavily laden dray horses.

I should say that, with a roadway such as I have described, a camber of about ¼ in. per foot, formed by rolling in the metalling from the sides towards the centre, should leave a roadway well suited for general use.

I have said nothing about scarifying, which I believe to be required for efficient road repair; but I think that the ideal scarifier has yet to be evolved, and that even where a machine is in use, hand scarifying would still be necessary, even as, at times, some hand-broken metal is found a useful cover to the less-expensive machine-broken metal. The great objection to the machine scarifying is the strain on the roller engine, especially in the lighter engines.

In conclusion, I would say that I think too much attention cannot be given to detecting and repairing the small potholes as they occur, "darning" them in with light metal by the use of the pick, and blinding with cinders—not stone crushings.

SHERINGHAM.

Mr. F. Hall Smith, M.I.M. and C.E., F.S.I., M.R.San.I., Engineer and Surveyor.

My council are converting all our roads and streets from flint to tar-macadam roadways, which, in my opinion, is absolutely necessary in these days of motor traffic.

When the road requires repair, I scarify the old surface, level, and run the roller over to partially consolidate, and spread the tar-macadam, 2-in. metal, about 1½ in. to 2 in. thicknesses. This is rolled down to finished surface, when I fill the interstices with local gravel, with all stones screened out, and roll again, and brush the gravel well in. I then tar-paint, and again cover with gravel, and this makes a splendid surface at a cost of 1s. 3d. per yard super. My roads are equal to any I have seen in towns, and only require repainting every three years.

STROOD (RURAL).

Mr. L. Randerson, District Surveyor.

We have 120 miles of highway, and 20 miles of these are maintained with tar-macadam or other bituminous binder as follows:—

Tarred Kentish Ragstone.—Many sections; has not withstood engine traffic very well, but most suitable for ordinary light motor and traffic roads. The best sections are of hand-broken material. Am of opinion

the better results would be obtained if better quality tar was used.

Quartzite.—This material has stood well. Sections laid three years ago show little signs of wear, and have had considerable heavy motor traffic to bear.

Tarlithic.—Short sections laid. Would appear suitable for light traffic roads.

Tarred Granite (Guernsey granite mixed with Tarvia on spot).—Several sections laid, some been down [illegible] years ago good heavy, and fairly heavy motor and engine traffic. Estimate several more years' wear from it.

Tarviated Binder Macadam (double binder).—Section laid four years ago is in splendid condition; section laid three years ago on same road and adjacent not so good. Will require repairs next year. Welsh stone used in first case and blue Scotch in second.

Same Material (single binder).—One section laid three years ago in good condition. Guernsey granite.

Bitumen.—Sections laid three years ago. Present condition fairly good. Bears fairly heavy traffic. Is laid under trees, and on a slight slope of about 1 in 20.

Tar-painting.—The full 20 miles are tar-painted each year. The best results are obtained where the drainage and foundations are good.

I am this year laying down several sections of [illegible] road using Welsh granite and St. Keverne. The council have decided to stop the use of flints and ragstone on about 50 miles of roads (where flints are not produced in the particular locality), and use granite.

WELLINGTON, SALOP (URBAN).

Mr. Geo. Riley, Engineer and Surveyor.

Wellington being a small district of 700 acres, with a population of 8,000, and only 10 miles of main and other roads, I have laid myself out for tar-painting the whole of the road surfaces, amounting to 93,000 sq. yds., once yearly. I have had erected brick tar vats capable of holding 100 tons of tar, sub-divided into seven compartments, each compartment being heated separately by means of live steam being blown into the vats. The surface of the roads being well swept and thoroughly freed from dust, the tar is carted on to the roads at boiling point, and laid on the surface by means of rubber squeegees, and thoroughly brushed into the interstices with ordinary bass brooms. After the tar is set, a small quantity of sand is sprinkled over the surface. Six workmen sweep and tar-paint from 7,500 to 10,000 sq. yds. per day of ten hours. I find for the year 1913 1 gallon of tar covered 5¼ sq. yds., and one load of clean pit sand 588 sq. yds., the details of cost per square yard being as follows: Crude tar, at 37s. 6d. per ton, ·428d.; sand, at 1s. 3d. per load, ·0305d.; labour, at 3s. 4d. per day, ·1011d.; carting, at 7s. 6d. per day, ·028d.; total, ·59d. per square yard. I may say that to-day, after a winter's wear, the road surfaces have a tar-macadam-like surface, and are in every way highly satisfactory.

(To be continued.)

PRO PATRIA.

In The Surveyor of August 21st, in the column of "Things One Would Like to Know," it was asked if it would not be possible to compile an "Honours" list of municipal, engineering and sanitary officials who are taking an active part in the great war. With a view to carrying out the suggestion we publish below such information as has come to hand, and should be obliged if readers would assist us by notifying us of other cases within their knowledge:—

Ashurst, J., city surveyor, St. Albans.

Ayre, C. A., third assistant engineer to the Watford Urban District Council, has received notice to hold himself in readiness for the Special Reserve.

Barker, E. A., electrical engineer, Barnsley Corporation.

Bell, Leonard, sanitary inspector, Westhampnett Rural District Council, Lieutenant and Transport Officer attached to the Eastern Mounted Brigade of Field Ambulance (Territorials).

Bennett, R. J., clerk to the borough engineer and surveyor of West Bromwich (Mr. Albert D. Greatorex, M.INST.C.E.), 5th South Staffs Territorials, Infantry Battalion.

Blake, Leslie, assistant surveyor to the Wincanton Rural District Council.

Carter, A. V., surveyor to the Droxford (Hants) Rural District Council, with the 9th (T.) Cyclist Battalion of the Hampshire Regiment.

Edwards, E. W., surveyor to the Blaenavon Urban District Council.

Foster, J. E., temporary assistant surveyor to the East Grinstead Rural District Council.

Garrett, H. A., borough surveyor of Torquay, Captain of Territorial Engineers.

Gladwell, C. W., assistant surveyor to the Eton Rural District Council, attached to South Midland Brigade Army Service Corps. Mr. Gladwell has volunteered for foreign service.

Hooley, E. P., M.INST.C.E., county surveyor of Nottinghamshire, with the 8th Battalion of the Sherwood Foresters.

Hunter, H., sanitary inspector to the Maldens and Coombe Urban District Council, Surrey, attached to Royal Army Medical Corps.

Jenner, A. J., inspector to the Battle Rural District Council, has volunteered for the front with the Yeomanry.

Johns, Percy, borough surveyor of Maidenhead.

Laban, O. G., surveyor to the Leake Rural District Council, has joined the Army.

Lane, W. G., borough surveyor and sanitary inspector of Ludlow, Captain, Ludlow Territorials.

Middleton, ——, inspector of nuisances to the Charlton Kings Urban District Council.

Overfield, H. Y., pupil of the borough engineer and surveyor of West Bromwich (Mr. Albert D. Greatorex, M.INST.C.E.), in the 5th Staffs Battery R.F.A., 3rd North Midland Brigade Territorials at Luton. The brigade has volunteered for active service.

Payne, ——, working manager at the East Grinstead Rural District Council's sewage farm.

Russell, J. W., third assistant to the borough engineer and surveyor of West Bromwich (Mr. Albert D. Greatorex, M.INST.C.E.), has joined the 5th South Staffs Territorials, Infantry Battalion.

Shaw, David Honeyman, assistant district master of works, Dunfermline District, Fife County Council, sergeant, Highland (Fife) Royal Garrison Artillery (Territorials). Volunteered for foreign service.

Smale, W. L. B., surveyor for the Northern District under the Liskeard Rural District Council, 4th Battalion of the Devon Regiment.

Stanton, S. G., second assistant to the borough engineer and surveyor of West Bromwich (Mr. Albert D. Greatorex, M.INST.C.E.), serving in the Motor Cyclist Corps, general headquarters, active service.

Tebbitt, H. S., surveyor and inspector to the Tutbury (Staffs) Rural District Council, field surveyor to the Burton Squadron, North Midland Command, Legion of Frontiersmen.

Tuffin, A. E., on the staff of the surveyor to the Teddington Urban District Council (Mr. M. Hainsworth).

Watts, T. N. W., surveyor and inspector to the Marlow Urban District Council.

Wright, J. R., assistant to the surveyor to the Redcar Urban District Council (Mr. J. Howcroft). Enlisted in the Royal Engineers.

In addition to the "Honours" list of municipal engineering and sanitary officials who are taking part in the great war, we think it will interest our readers if we also publish the names of those in the commercial world who are giving their services, and we have great pleasure in recording the following names of the "commercique" list:—

Beadle, Herbert, managing director of British Macadams Company and Road Maintenance Company, Limited, second lieutenant in the 4th Home Counties Howitzer Brigade.

Cooper, H. L., director of Cooper, Wettern & Co. and H. L. Cooper & Co., Limited, colonel commanding Transport Column A.S.C., Wessex Division.

We understand that both these gentlemen, who are well known to municipal and county engineers, have volunteered for foreign service. There are, doubtless, many other names which could be added to this list, and we shall be grateful for any assistance that can be rendered us in making it complete.

Housing in Rural Districts.*

By ERNEST HOLLOWAY, Surveyor to the Evesham and Pebworth Rural District Councils.

Many small districts are faced with a housing problem, and the writer is one of the many districts in which the closing of many houses [illegible] owing to the growth of the market gardening industry in the locality. The problem was faced in 1912 by first building sixty cottages in the parish of Broadway, then followed twenty-six at Offenham and ten at Pebworth (Glos), and there are schemes in hand for a further seventy-two cottages in various parts of the districts.

At Broadway we were able to let cottages to net at a rent having regard of 3s. 6d. per week, but this had to be abandoned, as to build substantial cottages meant that at these rentals there would be a charge on the rates of the various parishes. It will probably be agreed that it is impossible to build a three-bedroomed cottage in the average rural district at a lower figure than £150—that is, if the erection is to be there at the expiration of sixty years, which is the period of the loan on buildings.

It has been possible to erect them at this figure; in fact, the cost has worked out a little lower where the cottages have been built in blocks of four and six. Experience shows that the cost per cottage on a small scheme, say, of ten cottages has been very little more than where several times that number have been erected.

In this district it is not necessary to build cavity walls, and where good hard bricks have been obtained rough-casting can also be dispensed with.

One or two of the villages where schemes have been carried out are sewered, and have efficient outfall works, and in these cases the drains have been connected direct thereto. Where there are no such sewers cesspools have been provided. Without exception there has been a supply of tap water for every cottage, this being obtained from the waterworks in the Cotswold Hills, the scheme being one of gravitation to fifteen villages.

The type of cottage the council have decided on is one having a large living-room, with range and fitted dresser, a small scullery, with bath, copper, sink, and small cooking-stove, and a larder, coals, and store under the stairs, all under the main roof, and also, where possible, a water-closet, otherwise an earth-closet 12 ft. away from the house. On the first floor there are three bedrooms, two of which have fireplaces.

The construction of the cottages is as follows:—

Outside and party walls are of 9-in. brickwork, internal walls on ground floor 4½ in., and on the first floor 2-in. concrete partition slabs are used. The roofs are tiled, and have a pitch of 45 deg. In one case rough-cast has been used for the exterior walls. The floors of the living-room are 6-in. square tiles laid on 4-in. cement concrete, and in the scullery and other offices on the ground floor granolithic floors have been laid; upstairs, 1-in. best white flooring with shot edges is used, the timber being red deal throughout; the plastering on the ceilings is three-coat work, and on the walls two coats. In every instance casement windows are put in, and ample provision is made both for light and ventilation. The height of all rooms is 9 ft. throughout. A cheap way of supplying the bath with hot water is to raise the height of the copper to a few inches, and insert a bib-tap direct into it, carrying it over the bath; this, of course, can only be done where the bath adjoins the copper.

Land has cost an average of about £100 per acre, and with one exception road making, sewering, &c., have been avoided. The Broadway scheme of sixty cottages is on 9½ acres of ground. There were six pairs, six blocks of four, and four blocks of six, and the average cost per cottage for the building itself was £154. The rents vary in this scheme from 3s. 6d. per week to 4s. 6d., the council paying all rates, taxes, &c. The Offenham scheme has twenty-six cottages on 17 acres of land, ten being on 2 acres and the remaining sixteen on 15 acres, and the average cost per cottage was £155. The rents for these are 3s. 6d., 3s. 9d., and 4s. 3d., and in the latter case the tenants pay an extra 2s. 6d. per week for the acre of land. The Pebworth scheme is ten cottages in two blocks, and there are 2 acres of land; the cost was £146 each cottage, and the rents are 3s. 6d. and 3s. 9d. per week. The Littleton scheme is one of twenty-four cottages built in blocks of four, with a quarter to a third of an acre to each cottage, the rents in this case being 4s. and 4s. 8d. per week inclusive. The Harvington scheme has sixteen cottages on 8 acres of land, six of them having an acre each. The other schemes vary, plenty of land being given where it is likely to be profitable.

The loans obtained have been eighty years for the land, which means an annual payment of £3·7385 per cent for interest and repayment of loan, sixty years for buildings, which is £4·0089 per cent, thirty years for roads, £7·0361 per cent.

BROADWAY HOUSING SCHEME.

Estimated Balance Sheet.

Receipts.	£	s.	d.
26 houses at 6s. weekly, per annum	81	18	0
7 .. 3s. 9d.	68	5	0
24 .. 4	249	4	0
21 .. 4s. 3d.	215	14	0
	£635	1	0
Less yards and losses, 2½ per cent	16	2	0
	£618	19	0

Expenditure.	£	s.	d.
Public Works Loan Board. Repayment of principal and interest—			
£510 in 80 years at 3½ per cent	19	0	9
£9525 in 60 years at 3½ per cent	381	17	0
£500 in 20 years at 4½ per cent	35	3	6
Rates at 6 1 in the £	86	8	9
Taxes	1	4	3
Insurance	7	10	0
Supervision and collection of rents	15	0	0
Repairs and contingencies, £1 per house ...	60	0	0
Estimated annual surplus	12	14	9
	£618	19	0

Before deciding to carry out any scheme the council consider the records made under the Housing Acts as to inspection of cottages; a local inquiry is then held by the council in the parish concerned, and from the evidence obtained a report is prepared as to the number of cottages required. A site is fixed upon, a deposit paid, and instructions given as to the preparation of the plans, which are sent to the Local Government Board, together with an application for the necessary loans. The Government inquiry into the scheme and for the purchase of the land is held at one and the same time. Every care is taken in the matters of the site, both as regards its position, aspect, &c., and as to drainage.

The councils have, on the whole, been very fairly treated by the landowners, and in only one case was compulsory purchase considered.

A balance-sheet of one scheme is appended, from which it will be seen that this is self-supporting, after making every allowance for contingencies. In the other schemes the same result has been obtained, as the councils stipulate that there shall be no charge upon the rates. The rents fixed can be obtained, as the market garden labourer is better paid than the average agricultural labourer. There has been no difficulty in letting these cottages; in fact, the demand has exceeded the supply.

There have of late been many attempts to prove that a suitable cottage can be erected for about £100. These attempts as a rule take one or other of the following forms:—

(1) The substitution of wood or concrete for brick or stone as the chief material in construction.

(2) The cutting down of the sizes of rooms.

(3) The elimination of all expenditure devoted to giving a pleasing appearance to the cottages.

It will be agreed that all of these conditions are

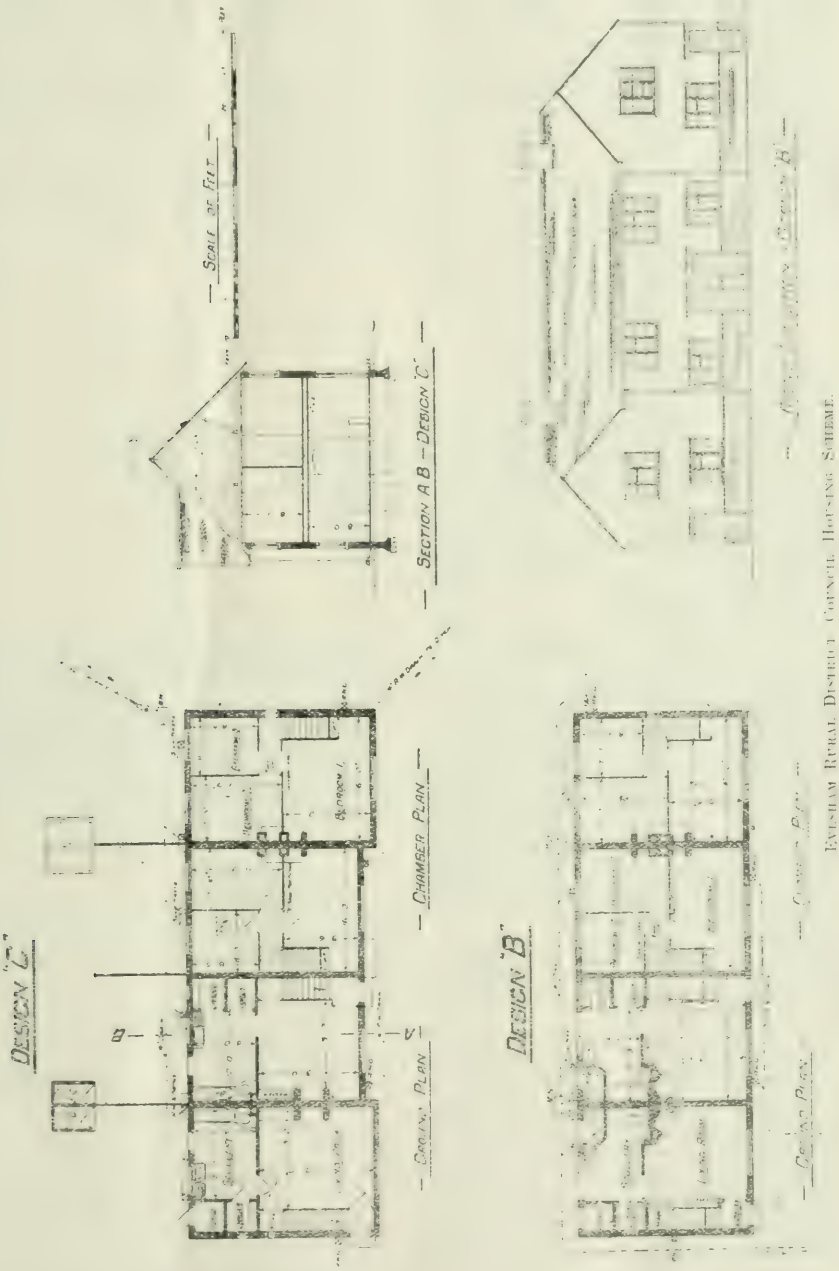
* Paper read at the Annual General Meeting and Conference of the Institution of Municipal and County Engineers at Cheltenham.

most undesirable, and that to carry out the by-laws and in every way to build a substantial cottage should be the effort of a public body.

The materials of construction should be such as to last the full period of the loans without undue expenditure upon repairs. The cottage should be rain-proof, damp-proof, and in every way sanitary, and the outer walls should be of such materials that there will be no sweating on the inside. The rooms should be of adequate size and well lighted and ventilated. The cottages should be constructed and grouped with a view to pleasing aspect.

When considering a housing scheme the question of by-laws should not be overlooked, and it is highly desirable that the most flexible by-laws should be in force, or the cost of the buildings, &c., will be very materially increased. The "Model" rural series are in force in these districts, and the only amendments necessary were in respect of the width of carriage-ways, and in the trapping of drains in each curtilage.

These plans of the cottages accompany these notes.



A short discussion followed the presentation of Mr. Holloway's paper at the Cheltenham meeting.

Mr. G. Bertram Hartfree (Alton) said he agreed with Mr. Holloway that cottages should be let at rents that would make them self-supporting. If the wages in a district were too small to allow the tenants to pay the rents demanded, surely it was a matter

[illegible] higher rates, not lower rents. They must not [illegible] or the low-paid man, it was simply a State subsidy for sweated labour. Mr. Holloway [illegible] in his plan, and he would like to [illegible] rural areas. He (the speaker) found them not altogether a success unless the authority undertook the work of emptying for the tenants, [illegible] the owners would not do the work. He had tried and seen very successful in some spots—making use of pails and emptying the contents on to gardens. There might be some objection to that [illegible]. Where it could be arranged he had found the filtration gutter of Dr. Poore very satisfactory.

He congratulated Mr. Holloway on erecting cottages at £100 each. He (the speaker) had got to as low a figure as £148, but he should like to ask Mr. Holloway whether he thought it in every way desirable to adopt tiled floors for living-rooms. They were inclined to be damp, and had a tendency to make the room cold. His first experience was with wood blocks, but he was now making use of Portland cement concrete. Mr. Holloway had referred to the £100 cottages. He (the speaker) had had an opportunity of seeing the two [illegible] had been erected, but the cheaper of the two did not cost £100, but £118, and it was certainly not designed to meet the needs of some Hampshire agricultural labourers, among whom a family of a dozen children was a common thing. He should like to know the wages paid in the different trades in the author's district, the price of bricks on the works, the approximate price of timber, and his price per cube foot for the whole work. He had tried to arrive at the figure of 4½d., but the nearest he had been able to approach that was 4⅝d. per cube foot.

Mr. A. J. REDFERN (Honiton) said he had as strong an objection as anyone to letting houses at a rent that did not provide an adequate return. At the same time they had to consider the health of the people, and the conditions under which they existed at the present time. He noticed that 2-in. concrete partition slabs were used in the bedrooms of the houses described in the paper. Did that thickness provide sufficient rigidity, and what provision was made for shrinkage and vibration caused on the floors? He saw the land had cost £100 per acre, and he should like to know whether that was a fair price for the ground. He was anxious to come across an authority who had exercised its power under the Act to get land at its real value. It would help them considerably in their difficulties if they could buy land at its ordinary agricultural value. He noticed that a considerable quantity of land was attached to the cottages, but his experience was that, even in the country districts, it was not wise to give a great deal of ground. A sixth of an acre was about the average size of garden the ordinary labouring man would work; therefore he suggested that in housing schemes it was better to provide that quantity or only an eighth of an acre, reserving, however, a quantity of land at the rear of the dwellings, so that those who wanted it could have the use of additional ground at a slightly increased rent. In conclusion, he asked whether the charge for the houses was on the parish in which they were erected, or on the whole district.

Mr. F. HARRIS (Tunbridge Wells) congratulated Mr. Holloway on his planning; at the same time he did not altogether approve of the awards that had been made in the premium scheme. He did not think the bath was necessary.

Mr. HOLLOWAY, in reply, said his paper referred to seven schemes, and in only one did he show a cesspool. In the case where he provided a cesspool they had a gravelly subsoil. Tiled floors were more popular than wood. As to wages, labourers were paid 4½d., bricklayers 8d., and carpenters and joiners 8½d. per hour. Bricks were 32s. 6d. per 1,000 at the station, and the whole worked out at 4⅝d. per cube foot. The price of land at £100 per acre was quite reasonable, as it was let at from £4 to £7 per acre. There had been only one case of compulsory purchase of land in England up to the present, and the award, he believed, was something like thirty years' purchase. Any rate charges would be on the parish.

Horseshoe Pillars.—A recent issue of *Country Life* contains an interesting photographic view of two pillars which have been cleverly built of thousands of horseshoes by a blacksmith on the London road between Fairford and Lechlade, Gloucestershire.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain.
Each man's opinion freely is his own
Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act II. 2.

NATIONAL RELIEF FUND.

To the Editor of THE SURVEYOR.

SIR,—It may be of interest to municipal officials to know what is proposed to be done in the way of voluntary contributions towards the above fund by the members of the various staffs of the Stoke-on-Trent Corporation.

A meeting representative of the whole of the officials of all departments was recently held, and a scale was discussed and a unanimous decision arrived at, that everyone in receipt of a salary should contribute to the fund.

At the same time it was thought that those in receipt of the higher salaries should contribute a larger proportion than those in receipt of smaller ones.

Consequently a scale was drawn up, of which the following is a copy:

	Weekly contributions s. d.
Persons whose salaries are under 10s. per week	1
10s. per week and under 20s. per week	3
20s. " " 30s. "	6
30s. " " 40s. "	9
40s. " " 50s. "	1 0
50s. " " 60s. "	1 3
60s. " " 70s "	1 6
	Per cent
70s. " " £200 per annum	2½
£200 per annum and under £250 per annum	2¾
£250 " " £300 "	3
£300 " " £350 "	3¼
£350 " " £400 "	3½
£400 " " £450 "	3¾
£450 " " £500 "	4
£500 " " £550 "	4¼
£550 " " £600 "	4½
£600 " " £650 "	4¾
£650 " " £700 "	5
£700 " " £750 "	5¼
£750 " " £800 "	5½
£800 " " £900 "	5¾
£900 " " £1,000 "	6½
£1,000 " and over	7½

The contributions are either being collected monthly by a representative in each department, or an order is signed authorising the borough treasurer to deduct it from the usual monthly salary cheques.

In this way it is expected that a very considerable contribution will be handed over to the fund each month for so long as the necessity therefor arises.

I may also state that practically every workman in the employment of the corporation in receipt of over £1 per week has voluntarily promised to contribute 6d. per week to the fund.—Yours, &c.,

A. BURTON,
Borough Surveyor.

Stoke-on-Trent.
September 7, 1914.

[Mr. Burton forwards with his letter a print showing how the scale of contributions works out in diagrammatic form, but as the reproduction of this presents certain difficulties, we are obliged to omit it.—ED. SURVEYOR.]

SANITATION OF A HEALTH AND PLEASURE RESORT.

To the Editor of THE SURVEYOR.

SIR,—There is no doubt that the work of the Blackpool sanitary inspectors is very arduous and most thorough from the description given in your issue of August 28th. There is one portion of the report, however, which is uniform with the majority of reports in this country. I refer to the treatment when damp-proof courses are missing.

The report states that damp-proof courses are fixed in the walls where there is any sign of dampness. I do not know the procedure at Blackpool, but the usual method of providing a dampcourse is to cut out one course of bricks or stone, and then to insert sheet lead or blue bricks (sometimes slate) bedded in cement. This is a very slow process, but until the advent of the system I am about to speak of, there was no other method. If the brick or stone walls were very hard, and even when soft bricks were encountered, a man could not proceed very quickly in such an awkward position close to the ground, and the making good took just as long as the cutting out.

The new system is to treat the interior walls of the

building which are affected by the damp by hacking off the plaster, brushing well down, after taking the joints to form a key, and then cementing 1 in. thick with Pudlo cement. A thin film of Parian or [illegible] may be used to finish. This system has saved considerable expense to owners of condemned cottages. Many sanitary inspectors have intimated to me that it [illegible] them of one of the difficulties of their profession. It is not at all a pleasant task for a sanitary inspector to have to inform the owner of a small cottage that his house is condemned simply through dampness. Such a man will sometimes be unable to afford the excessive cost of inserting a new damp course, especially if the walls are thick.

The new system is extremely economical, because the cost of the Pudlo for ordinary cases is only 9d. per yard, to which must, of course, be added the man's time and the cost of the cement and sand. The [illegible] Portland cement keeps back the dampness, and the most that it ever rises by capillary attraction and the heat of the room in driving it higher is 2 ft., so that if the cement is rendered 2 ft. higher than the existing dampness shows, that is quite sufficient. Sometimes it is only necessary to render a dado round the room. . . .—Yours, &c.,

J. H. Kerner-Greenwood.

King's Lynn.
September 3, 1914.

THE ROAD BOARD AND ULSTER.

To the Editor of The Surveyor.

Sir,—With reference to the paper on "Road Improvement in the North of Ireland," by Mr. J. W. Leebody, which appeared in the issue of The Surveyor for August 21st last, I beg to enclose herewith, for your information, copy of a letter which I have to-day addressed to Mr. Leebody, and dealing with his remarks as to the policy of the Road Board in Ulster.—Yours, &c.,

H. P. Maybury.

Road Board Offices,
Queen Anne's Chambers, S.W.
September 8, 1914.

[COPY OF LETTER REFERRED TO.]

Dear Sir,—The attention of the Road Board has been called to your paper on "Road Improvement in the North of Ireland," published in The Surveyor of 21st August, in which you say: "It is rather unfortunate that the Road Board policy in Ulster has, for so far, been to look with a more friendly eye on grants for tar treatment than on those for improved drainage."

The board think it important that I should correct the mistaken impression to which you give publicity. The attitude of the board is just the reverse of what you state. Improved drainage, where required, must obviously precede any form of improved surfacing, whether by tar treatment or otherwise.

As regards tar treatment, the board have not by any means urged such treatment in Ulster or in any part of Ireland. Grants for over £63,000 have been made in Ulster, and only about £7,000 of that amount represents tar treatment, and the latter figure has been almost confined to Antrim, with a small amount in Armagh.

Roads which have to carry much motor traffic require, for durability, treatment with tarry or bituminous substances, but tar treatment can only be justified on roads on which the traffic is substantial in volume, and the annual cost of maintenance is greater than it is, generally speaking, on rural roads in Ireland.

Yours faithfully,
(Signed) H. P. Maybury.

J. W. Leebody, Esq., B.A., B.E., County Surveyor, Tyrone (South) County Council, County Surveyor's Office, Dungannon.

PRECAUTIONS AGAINST EPIDEMICS.

To the Editor of The Surveyor.

Sir,—Judging from the weekly mortality returns of the big towns, the medical officers' returns of the smaller towns, urban and rural district councils that are published, the country, as a whole, is at present in a very healthy state. The reason generally given is the advancement of scientific sanitation; but it has been almost neglected in some parts. How is it, then, to be accounted for? Surely, by the remarkable weather conditions, especially the health-giving winds bringing increased quantities of purifying oxygen, the germ-destroying active rays of bright sunshine, and also, to some extent, the consequent desiccating droughts, heavy, cleansing rains, cool summers and mild winters which of late years have prevailed, as against the calm, gloomy, sultry, muggy and thundery conditions which have been comparatively absent, and are conducive to those diseases brought about in conjunction with neglected sanitation. A close analytical comparison between the meteorological and the medical officers' returns available would bring out many facts at present little thought of, it is certain.

If history repeats itself, as it generally does, are we prepared? Have we done our best to forefend against what is likely to occur after a serious crisis such as we are going through at present? Is not delay like tempting Providence? Are we to wait for an epidemic before anything is done? Does it not show more than ever the necessity for a central board of thoroughly qualified members who could judge each case impartially, and on its own merits? In fact, should they not be the last word in practical experience—by which is meant, in this case, science made as perfect as possible.—Yours, &c.,

G. W. B. Macturk
(Author of "Hydrology of the Howdenshire District").

15 Bowlalley-lane, Hull.
September 8, 1914.

COTTAGE BUILDING.

To the Editor of The Surveyor.

Sir,—A Local Government Board Inquiry is just about to be held in this town for the loan of £61,000 for carrying out a housing scheme, which has already received the sanction of my council.

I propose carrying out the roads, sewers, &c., by administration, but I have not yet decided as to whether I shall invite tenders for the building of the cottages.

I shall therefore be glad if any of your readers who have carried out similar schemes, and have built the cottages by administration, will kindly communicate with me.—Yours, &c.,

A. Ernest Prescott,
Borough Surveyor.

Eastbourne.
September 8, 1914.

Town Planning Schemes.—It is understood that the Local Government Board have given authority for the preparation of five further town planning schemes under the Housing and Town Planning Act, 1909. The schemes are authorised to be prepared by the corporations of Barrow-in-Furness, Nelson, and Newport (Mon.), and the urban district councils of Hendon and Otley.

Glasgow Sewage Works.—The Glasgow Corporation Sewage Committee recommend the preparation of the necessary specification, schedule, and plans for the construction of the sludge main outside of the Dalmarnock and Shieldhall works, and the carrying out of the excavations necessary for the third section of the filter beds. The estimated cost of this section amounts to £33,000.

Destruction of Bangor Slums.—The Bangor City Council some time ago ordered the demolition of a number of houses in Kyffin-square, which the medical officer had condemned as unfit for human habitation. The owners appealed, and the Local Government Board held an inquiry. The board have now reported to the Bangor Council that, after careful consideration, it had been decided that the demolition orders must be carried out, the cost of the appeal to be paid by the protesting owners.

Road Locomotives.—Germany exported in 1912 steam road locomotives, steam rollers and traction engines to the value of £1,043,600, as against £628,300 worth of road locomotives and steam rollers imported from the United Kingdom in 1913, and steam road locomotives and traction engines to the value of £71,300 from Austria-Hungary. The Russian market offers the largest scope for British enterprise, the combined German and Austrian exports to Russia annually being about £578,900 against the British exports, which amounted to £18,700 only. Other large markets worthy of serious consideration by British exporters of road locomotives (the *Standard* points out) are Brazil, France, Spain, Italy, Bulgaria, Rumania, Turkey and Egypt.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address. All correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction (i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

Engineer as Arbitrator under Contract—Bankruptcy of Contractors—Trustee's Power to Examine Engineer.—A [illegible] the county court judge to make an order directing that the engineer should be a competent witness for the appellants, of Bury, and the bankrupts should be examined by the trustee under sec. 27 of the Bankruptcy Act, 1883. That section provides that [illegible] person whom it may deem capable of giving information respecting the debtor, his dealings or property, may be summoned by the trustee to be examined by the Trustee in Bankruptcy. The ground of the refusal was that the engineer could not give any information that was not already in the possession of the bankrupts. Mr. C. Atkinson, K.C., and Mr. E. J. Rimmer appeared for the appellants, and Mr. J. Langdon, K.C., and Mr. Hanson for the respondents. Mr. Atkinson said that the decision of the county court judge was clearly wrong because the object of the section was to enable the trustee to obtain facts from the witness about which the information given by the bankrupts might be either incorrect or unreliable. He was stopped by the Court. Mr. Langdon, K.C., said that he could not support the ground of the decision of the county court judge, but he urged strongly that, as the engineer had, under certain matters in relation to the contract, an absolute discretion, and as all other matters must be referred to him as arbitrator, his capacity under the contract was purely judicial, and he ought not, therefore, to be called upon to answer questions relating to these matters. The Court allowed the appeal, and ordered that the engineer should attend for examination. Mr. Justice Horridge said that the grounds of the decision of the county court judge were clearly wrong, as otherwise examinations under the section would be abortive. Mr. Langdon had, however, raised a more formidable point, and if he thought that the examination would necessitate the engineer giving a decision upon matters which would afterwards come before him as arbitrator, he would not have made the Order. He was, however, not satisfied that there were no matters upon which it was proper that the trustee should have information which did not require him, in answering, to anticipate his decision as arbitrator. In this case there had been a forfeiture by the building owners, and the trustee was entitled to examine the engineer to find out what had been the course of proceedings since the contractors went off the work. There were, in his opinion, also other matters about which the engineer could give the trustee information which he was entitled to know. Mr. Justice Lush agreed. Leave to appeal was given.

Housing Acts—"Obstructive Building" Workshop.—An important point as to the powers of the local authority under the Housing Acts to pull down a building was decided in *Judson v. Knutsford Urban District Council* (July 9th, Chancery Division, Mr. Justice Eve). Sec. 38 of the Housing of the Working Classes Act, 1890, provides that, if a medical officer of health finds that "any building," although not in itself unfit for human habitation, is so situate that by reason of its proximity to or contact with any other buildings it causes one of the detrimental effects particularised in that section, he is to notify the local authority, to whom power is given to pull down such "obstructive building." The council, proceeding under this section, gave notice that they proposed to pull down a workshop belonging to the plaintiffs. This was followed by a notice that the council intended to purchase the site of the workshop, and by a counter-[illegible] from the plaintiffs if they wished to retain the site on receiving compensation for the pulling down. Negotiations were entered into, but, no agreement being come to, the council gave notice that they would apply for the appointment of an arbitrator. The plaintiffs then brought this action, claiming a declaration that they were entitled to the workshop without let or hindrance from the council, and an injunction to restrain the council from taking steps to demolish the building. In support of the plaintiff's case it was contended that the workshop was not a "building" within the meaning of the section, the argument being that the parenthetical clause "although not in itself unfit for human habitation" indicated that the enactment only applied to buildings intended for human habitation. Mr. Justice Eve, however, held that the section applied to buildings of every description, and moreover that the plaintiffs, by their conduct, were estopped from denying that the workshop was not within the section. The action was dismissed with costs.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used

Laying Out New Streets.—"Tapo" writes: AB is a road which has not been taken over by my council, but was made, in the first instance, as an occupation road for the purpose of giving access to land and houses belonging to different owners. It ends in a cul-de-sac, and has been used by the public for the past thirty years. A private company have bought land abutting on to the road AB for building purposes, and they have forwarded an estate plan showing their intention of laying out part of the estate. The company contend that AB is their approach to the land, and in order to comply with by-law No. 2 (copy forwarded) they have set back the houses 15 ft. from the centre of the road AB so as to make a street 30 ft. wide. The street from C to D is 18 ft. wide, and the back street EF is shown to be 9 ft. wide. The land at the rear belongs to another owner, but if bought by the company it could be utilised for building purposes. (1) Is AB the company's approach road, or have they only the right of user, as the land and houses below B belong to different owners, and consequently the company could not close the road? (2) Should not CD be their approach road, and, in consequence, to comply with the by-laws be 30 ft. wide? (3) In order to comply with By-law 5 and 5a, should not the back street EF be 18 ft. wide? (4) If the land at the rear was purchased and laid out as shown, would not the streets between the fronts of the houses be 30 ft. wide, and they would if CD in question 2 was not the principal approach, be approached by a street 18 ft. wide? And would not this be a sufficient reason for making the street CD 30 ft. wide?

[Copy of By-laws.]

(2) Every person who lays out a new street as a carriage road, shall lay out and form such street at least 30 ft. wide.

(4) Every person who shall construct a new street which shall exceed 100 ft. in length, shall construct such street for use as a carriage road, and shall, as regards such street, comply with the requirements of every by-law relating to a new street intended for use as a carriage road.

(5) Every person who lays out a new street which shall be intended for use otherwise than as a carriage road, and shall not exceed in length 100 ft., shall so lay out such street that the width thereof shall be 18 ft. at the least.

(5a) Provided always that this by-law shall not apply in any case where a new street shall not be intended to form the principal approach or means of access to any building, but shall be intended for use solely as

The Surveyor

And Municipal and County Engineer.

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a separate means of access to any premises for the purpose of removing therefrom the contents of the receptacle of any privy, or of any ashpit, or of any cesspool, without carrying such contents through any dwelling-house or public building, or any building in which any person may be, or may be intended to be, employed in any manufacture, trade or business.

(1) I presume that by the expression "approach road" is meant a road which is intended to form the principal approach or means of access to a building or buildings. In this sense the road AB appears to be an "approach road." The company's rights with respect to the road depend upon circumstances. (a) Although originally an occupation road, it may have become a public highway (notwithstanding that it has not been taken over by the council); (b) or it may have been conveyed to the company subject to the existing rights of way, public or private; (c) or, again, a right of way over the road may have been granted to the company in common with other owners or occupiers. (2) Apparently the road CD is not intended solely as a separate means of access for removing dust, &c. Unless so intended, it is not within the exception provided for by by-law 5a, and if it is being laid out as a carriage road it must be 30 ft. wide. It is to be observed that, in order to come within the above exception, a road must fulfil two conditions—viz., (a) it must not be intended as the principal approach or means of access to a building, and (b) it must be intended as a separate means of access for removing refuse, &c. If it does not fulfil condition (b) it is not within the exception even though it may fulfil condition (a). (3) Yes, unless it fulfils conditions (a) and (b) above mentioned. (4) See reply to No. 2. The street between the houses shown in red would have to be 30 ft. wide if laid out as a carriage road, unless it fulfilled conditions (a) and (b).

COMBINED DRAINS.—"W. S." writes: A is the owner of two tenements separated by an occupation road. The drainage (which includes the rainfall pipes from each house) is piped into a drain laid in this road and thence forward to the stream. The rural council have laid sewers within 100 ft. from the houses, and called upon A to connect the drainage thereto. He (A) alleges that the drain in the road (taking the drainage of two houses) is a sewer, and that it is the duty of the rural district council to do the work. The regulations of the council do not permit the admittance of rain water to the sewers, and to connect the existing drain to the sewer would, of course, violate their own regulations. The rural district council contend that these houses have not sufficient drainage, as per sec. 23 of the Public Health Act, 1875. Will you kindly say if, in your opinion, A is right in his contention, or would the rural district council be justified in carrying out the work of laying new drains for the sewage only?

The road drain is a "sewer" from the point at which it receives the drainage of the two houses. If the house drains are sufficient for effectual drainage the council cannot proceed under sec. 23, but they could proceed under sec. 24.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bishop's Stortford U.D.C. (August 27th. Mr. E. Dudley). £1,980 for the purchase of the Wharf House estate for the purpose of council offices and depot, and property in Dane-street for street widening. Mr. C. J. Hancox, clerk of the council, stated that the present offices and depot were inadequate, and that Dane-street had become too narrow for the increased traffic of the district. The surveyor, Mr. R. S. Scott, explained the nature of the proposed works. There was no opposition.

Bispham U.D.C. (August 25th. Mr. A. G. Drury). £1,805 for the widening and improvement of Red Bank-road. The amount was made up by £330 for the purchase of the land, and £1,475 for the improvements. The area of the land was stated to be 2,513 sq. yds., which worked out at something like 2s. 7½d. per yard, but on the top of that there was the cost of sewering. The surveyor, Mr. T. Harrop, submitted the details of the proposed works.

Bradford T.C. (September 2nd. Mr. M. K. North). £5,740 for the construction of an open-air swimming bath at Lister Park. It was stated that the bath would be 150 ft. long and 60 ft. wide, the depth at the deep end to be 6ft. 6 in., and at the shallow end 3 ft.

Brighouse T.C. (September 2nd. Mr. H. R. Hooper). —£1,400 for repaving the Bradford and Huddersfield road. £1,100 for the cost of installing automatic clocks on gas lamps, and £583 for works of sewerage in a number of small streets.—With respect to the highway repair, the town clerk stated that the work was being done with the sanction of the West Riding County Council, and the latter authority would pay the annual sums of principal and interest. As to the placing of clocks on gas lamps, the corporation had already made extensive experiments, and, having found the system to work satisfactorily, they were now desirous of extending it to all the lamps in the borough. There was no opposition.

Cleckheaton U.D.C. (September 8th. Mr. F. O. Stanford).—£2,200 for the purposes of the electricity works.—It was stated that it had originally been intended to expend a much larger sum on extensions and alterations. The present application refers to the cost of a storage reservoir and of a new switchboard. The council intended, in view of prospective distress on account of the war, to make the reservoir with direct labour.

Grimsby T.C. (September 8th. Mr. Edgar Dudley). —£4,620 for the purchase of land on the Bradley estate for the purpose of public walks and pleasure grounds.—The town clerk, Mr. J. W. Jackson, said that the estate recently came into the market, and an excellent opportunity presented itself for the corporation to acquire it. The purchase was made at public auction at a very low price.

Nelson T.C. (September 1st. Mr. H. R. Hooper). £21,500 for the purchase of part of the Reedyford estate for the purpose of a refuse tip.—The borough surveyor, Mr. W. Shackleton, stated that the land it was proposed to acquire was 28.068 acres in extent. The estate formed a natural valley or basin suitable for tipping purposes; in fact, it would not be possible to use the land to advantage without tipping. The total available tipping space was about 483,000 cub. yds.

Newry U.D.C. (September 1st. Mr. A. D. Price). —£1,200 for the extension of the town hall, £700 for the construction of a new road, and £150 (supplemental) for the completion of the erection of lodging-houses.—Mr. Wm. Cronin, town clerk, and Mr. Charles Blaney, surveyor, gave details of the proposed schemes.

Plymouth T.C. (August 28th. Mr. W. O. E. Meade-King).—£1,561 for street improvement works in Peverell Park-road-lane East, Whiteford-road-lane, Pounds Park-road-lane North, Beechwood-avenue-lane, and Ladysmith-road.—The borough engineer, Mr. J. Paton, submitted details of the work, and the mayor and Mr. W. C. Willey supported the application, stating that the improvements were urgently needed, and had been requisitioned by the residents.

Poulton (Lancs) U.D.C. (August 18th. Mr. F. H.

[illegible] for the street improvements. It was stated that the loan was required for repayment to the [illegible] Mr. R. Moss [illegible] the proposed works, and [illegible] that [illegible] year.

Saffron Walden T.C. (August 18th. Mr. A. G. [illegible] £400 for [illegible] the [illegible] Mr. A. H. [illegible] and it was agreed the consideration of the [illegible] should be [illegible] to the [illegible] at the rate of £10 a year.

Skipton U.D.C. (September 1st. Major J. Stewart) [illegible] the extension of the seaside [illegible] Mr. A. E. W. Middle[illegible] stated the scheme in detail, and the inspector, in [illegible] a question, said it seemed to advisable to proceed with the preparation of the contracts, said [illegible] suggested that the Government should [illegible] make any modifications in the scheme.

Sunderland T.C. (September 4th. Mr. H. R. Hooper) [illegible] the gas undertaking.—Evidence given by the borough accountant (Mr. J. Patrick) and by the electrical engineer (Mr. A. S. Blackman) was to the effect that the loan was required for the renewal of mains, extensions, and additional machinery. It was stated that the existing debt on the undertaking had been reduced to £[illegible] in six years.

Thurrock, Grays, and Tilbury Joint Sewerage Board (August 27th. Mr. P. M. Crosthwaite).—£99,[illegible] for the purposes of sewage disposal, including the execution of works in the parish of West Tilbury. Mr. Maurice Taylor explained that the scheme was for a main intercepting sewer starting in Purfleet. The whole of the sewers were designed in accordance with the requirements of the Local Government Board—laid in straight lines, and provided with manholes approximately some 100 yds. apart. The district was extremely flat, and there was very little difference between the level of the ground at the railway crossing and the level at the outfall site. He explained in detail the line through the district it was proposed to sewer, from Purfleet, picking up Grays, and on to Tilbury, and carrying a length of sewer to the outfall works, which would be outside the borough's district.

APPLICATIONS FOR LOANS.

Alnwick U.D.C. £6,950 for the erection of cottages, and £350 for road work.

Ammanford U.D.C.—£1,725 for water supply extension.

Bridgwater R.D.C.—£770 for the purchase of a steam roller.

Cardiff T.C.—£2,372 for works in public parks.

Darwen T.C.—£1,125 for the construction of a bowling green, bowl house, and tennis courts.

Dewsbury T.C.—£3,200 for works of sewerage.

Halifax R.D.C.—£2,610 for road improvement.

Hereford R.D.C.—£3,600 for hospital extension.

Horbury U.D.C.—£4,900 for the provision of a recreation ground.

Leek U.D.C.—£2,455 for new streets.

Little Lever U.D.C.—£7,321 for a housing scheme.

Mansfield Woodhouse U.D.C.—£2,500 for laying out a park.

Middlesbrough T.C.—£4,350 for the purchase of a site for a school.

Newcastle-on-Tyne T.C.—£10,710 for road widening.

Reading T.C.—£6,500 for road improvement.

Sowerby Bridge U.D.C.—£2,610 for road improvement.

Stroud U.D.C.—£500 for the purchase of land for a housing scheme.

Swindon T.C.—£33,000 for sewage works extension.

Wigan T.C.—£27,165 for the erection of 138 workmen's dwellings, and £11,881 for repaving works with setts or cubes.

LOANS SANCTIONED.

Ashton-under-Lyne T.C.—£42,000 for extensions to the electricity works, £14,000 for improvements at the sewage works, and £426 for alterations to the Textile School.

Atherstone R.D.C.—£1,440 for the purchase of land for a housing scheme.

Brixham U.D.C.—£3,810 for the provision of working-class dwellings.

Bosmere and Clayton R.D.C.—£1,300 for a housing scheme.

Burnley R.D.C.—£450 for sewerage work.

Caerphilly U.D.C. £2,853 for laying out a recreation ground.

Deptford B.C.—£1,500 for the erection of washing baths.

Malvern U.D.C.—£1,600 for electricity plant.

Oxford T.C. [illegible] for sewage works.

Pebworth R.D.C. £2,2[illegible] for a housing scheme.

Portslade U.D.C.—£3,300 for works of surface-water drainage.

Romford R.D.C.—£2,095 for private street improvement and £[illegible] for works of sewerage.

Swaffham U.D.C.—£1,110 for cemetery extension.

Torquay T.C.—£5,000 for electric lighting mains extension.

Wakefield T.C.—2,450 for sewer reconstruction.

Welwyn R.D.C.—£1,332 for works of water supply.

FORTHCOMING INQUIRIES.

SEPTEMBER. £

14.	**Bedford.** For the purpose of a dispensary (Dr. F. R. Seymour)	—
14.—**Woking.**	For a housing scheme (Mr. C. H. Eyles)	5,800
15.—**Barnsley.**	For street improvement (Mr. F. H. Tulloch)	11,137
15.—**Clun.**	For works of water supply (Mr. A. W. Brightmore)	250
15.—**Crowmarsh.**	For a housing scheme (Mr. C. H. Eyles) ...	550
15.—**Eastbourne.**	For a housing scheme (Mr. H. S. Stewart)	60,515
15.—**Gosport.**	For the purchase of land (Mr. Edgar Dudley)	3,200
15.	**Harrington.** For the gas undertaking (Mr. H. R. Hooper)	1,200
15.—**Hawarden.**	For sewerage and the erection of cottages (Major C. E. Norton)	1,300
15.—**Llanelly.**	For a housing scheme (Mr. Edward Leonard)	15,910
15.	**Penrhyn.** For works of water supply (Major J. Stewart)	3,120
15.—**Swansea.**	For works of water supply (Mr. M. K. North)	700
15.—**Tendring.**	For works of water supply (Mr. R. G. Hetherington)	1,500
15.	**Wem.** For the provision of a cattle market (Mr. R. H. Bicknell)	3,194
15.	**Withernsea.** For sewerage and street works (Mr. H. Shelford Bidwell)	1,000
16.	**Barry.** For a housing scheme (Mr. Edward Leonard)	6,500
16.—**Burry Port.**	For the purposes of sewerage, public offices, public abattoir, and water supply (Mr. A. W. Brightmore)	19,180
16.	**Cleethorpes.** For the purposes of electric lighting (Mr. T. C. Ekin)	10,000
16.	**Colwyn Bay.** For road construction (Major J. Stewart)	1,040
16.—**Morpeth.**	For a public improvement (Mr. H. R. Hooper)	362
16.—**Porthcawl.**	For works of sewerage (Mr. M. K. North)	2,600
16.—**Stourbridge.**	For street improvement and the erection of public conveniences (Mr. R. H. Bicknell) ...	1,050
17.	**Aberdare.** For the provision of a depot (Mr. M. K. North)	2,100
17.—**Brymbo.**	For the purpose of street lighting (Major J. Stewart)	300
17.—**Chippenham.**	For works of water supply (Mr. A. W. Brightmore)	1,500
17.—**Hemel Hempstead.**	For a housing scheme (Mr. H. A. Chapman)	3,580
17.—**Hexham.**	For works of water supply (Mr. H. R. Hooper)	500
17.—**Prestwich.**	For private street improvement (Mr. F. H. Tulloch)	314
18.—**Caerphilly.**	For works of sewerage (Mr. M. K. North)	3,000
18.—**Whitstable.**	For private street improvement (Mr. F. H. Tulloch)	568
18.—**York.**	For the purposes of a depot and road widening (Mr. H. R. Hooper) ...	2,025

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

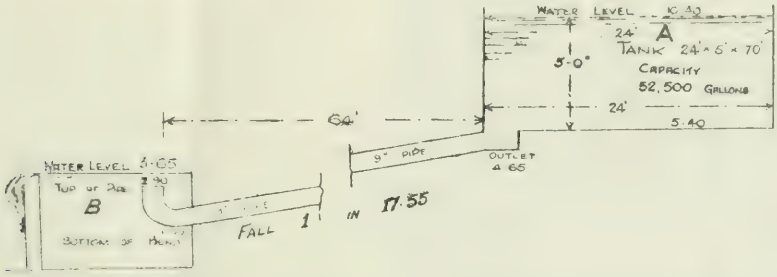
QUESTIONS.

This week answers are invited to the following questions:—

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. (Xing.)

418. Iron Curved Roof.—Show details of an iron curved roof of 40-ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G. F., *Buckfastleigh.*)

420. Flow of Water. Assuming that the lower tank B in the accompanying diagram is full of water, and also the 9-in. pipe up to the level of 3·65, what time would it take to empty tank A if the outlet was open full bore? (A. S., *Beverley.*)



421. Reactions of Beams. Show how to find (graphically or otherwise) the pressures on the two supports of a horizontal beam which is loaded at any given points.

422. Building Construction.—The earth in front of a semi-basement to a house has to be supported for a depth of 6 ft. Give a section of a suitable retaining wall, and prove its stability by a graphic diagram.

423. Sewer Construction.—Show by sketches (plan and section) the junction of a 3-ft. and a 5-ft. brick barrel sewer.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

419. Practical Mathematics.—Explain a graphical method for solving simple simultaneous equations, and give a worked example.

Consider the two simultaneous equations—

$$3x + 7y = 27 \quad . \quad . \quad (1)$$
$$5x + 2y = 16 \quad . \quad . \quad (2)$$

they could be written

$$x = \frac{7y + 27}{3} \quad . \quad . \quad (a)$$

and

$$x = \frac{-2y + 16}{5} \quad . \quad . \quad (b)$$

In the two equations (*a*) and (*b*) we could insert a series of values for y, and obtain a series of values for x. If we then plotted the values for (*a*) and those for (*b*) we would obtain two distinct graphs, both of which would be straight lines, as the equations are of the first degree. We want now values of x and y which, when put into (1) will solve it, and which when put into (2) will solve it also. Or, graphically, we require the co-ordinates of a point on the graph of (1) which are equal to the co-ordinates of a point on the graph of (2) [(1) and (2), of course, yield the same graphs as (*a*) and (*b*)] Obviously these two points must coincide, since their co-ordinates are the same, and this will take place at the intersection of the two graphs.

We can now proceed to plot the graphs and find the co-ordinates of the point of intersection, and thus find the values of x and y, which will solve the two equations. Since the graphs are straight lines it will only be necessary to have two points on each. Looking at (1) and (2), the easiest way to find two values for x and y in each is to make first $x = 0$, and then $y = 0$. When we come to plot them we shall find that we have found the points where the two graphs cut the axis of x and of y.

Proceeding with this side by side we have—

$3x + 7y = 27$ . . (1)	$5x + 2y = 16$ . . (2)
put $x = 0$ $0 + 7y = 27$	$0 + 2y = 16$
$y = 3{\cdot}86$	$y = 8$
$x = 0$	$x = 0$
put $y = 0$ $3x + 0 = 27$	$5x + 0 = 16$
$x = 9$	$x = 3{\cdot}2$
$y = 0$	$y = 0$

Tabulate the results as follows

Equation (1).		Equation (2).	
x	y	x	y
0	3·86	0	8
9	0	3·2	0

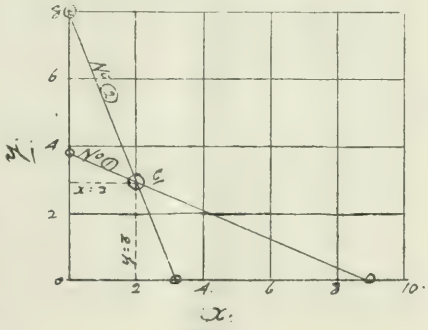


FIG. 1.

Plotting these values (Fig. 1) we see that the co-ordinates of the point of intersection are $x = 2$, $y = 3$,

and these are the values which will solve both equations simultaneously. (N. S. J., *Darlington.*)

Notes.

A correspondent has submitted the following general notes on the graphical solution of simultaneous equations of a higher degree than the first:—

I propose to detail the general mode of procedure for solving simultaneous equations, to work through, step by step, a suitable example, and finally to indicate the special cases which occur in actual practice, together with hints, &c., for rapid and easy solution. First, examine the equations very carefully, noting the highest power of any term, and endeavour to ascertain roughly what are the practical working values of the equations. Next, arrange the terms in each equation so that it is presented in the most convenient form for substitution of different values. Now arrange the component terms in a vertical column, one under the other, and in the lowest space write the complete equation. Rule out in tabular form for a number of values (see Table I.). By this means it is easy to perceive at a glance any error made in working out values, should it be found that the plotted curve did not assume a regular shape. We now proceed to give numerical values to x (if the equation is a function in x), and work out the value of the equation for such values. Care and discrimination must be exercised in giving the values to x, and by trial it should soon be found what are the "working values." Always try the value "x equals zero," and note what value of x reduces the expression to zero or to infinity (if any). Never omit to give negative values as well as positive, particularly in the case of a hyperbolical expression. Having obtained a suitable number of values, notice the ranges of the values, positive and negative, of the ordinates and abscissæ. Choose the scales of representation so that the graphs take up the whole of the space at our disposal. This latter is a most important point, as it enables us to plot the graphs, and to read off values ultimately, with very great accuracy. Even so, if extremely accurate results are required, it is advisable to draw out to a larger scale those portions of the graphs where they intersect, carefully selecting a few points in the neighbourhood. Thus, in the worked example, it would be advisable to draw out two more graphs giving values to a greater degree of accuracy, one for the point (*a*) and the other for the point (*b*). Let us suppose we have to solve graphically the simultaneous equations:—

$$y = x^3 - 3x + 2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(i)}$$

$$x - 2y - 2 = 0 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(ii)}$$

We will first of all deal with the second equation. It can be rearranged, and thus becomes $2y = x + 2$ *i.e.*, $y = \frac{x+2}{2}$. It is immediately obvious that this graph is *a straight line*, for it only contains terms of the first degree, and is thus of the form $ax + by = 0$.

It is important to notice that we need take two values of x only (fairly wide apart for accurate drawing), as only one straight line can pass through two points. Let us at once derive suitable values for this equation. Thus—

$$\text{when } x = 0, y = -1$$

$$\text{and when } x = -2, y = 0$$

We now turn our attention to equation (1), and proceed to give suitable values to x, and work out the values of y—*i.e.*, of x^3+2. Arranging the work in tabular form, as detailed above, we obtain the following:—

x	-3	-2	-1	0	$+1$	$+2$	$+3$
x^3	-27	-8	-1	0	$+1$	$+8$	$+27$
$-3x$	$+9$	$+6$	$+3$	0	-3	-6	-9
$y = x^3 - 3x + 2$	-16	0	$+4$	$+2$	0	$+4$	$+20$

Table I.

Plotting the above values and the two values of equation (1) we get a graph of the two, as shown in Fig 1. It will be seen that the curves intersect in three points, A, B and C, and since each of these points is on *both* graphs, it follows that the value of x and the value of y at each point give solutions to the equations—*i.e.*, they give the common roots of the

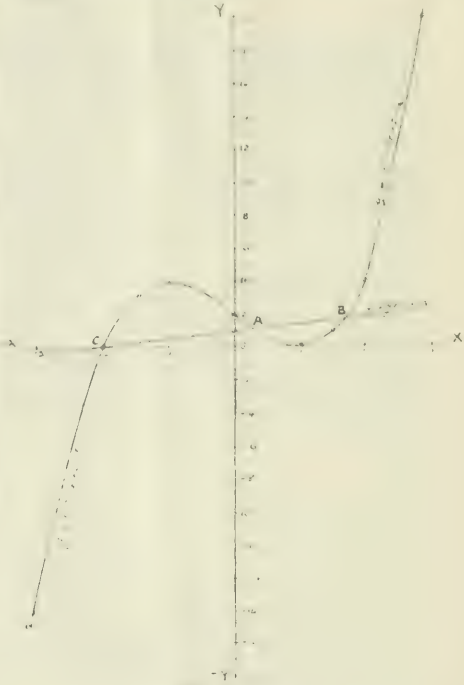


Fig. 1.

two equations. Reading off the values from the graph, we see that the roots common to the two equations are:—

$$x = +0{\cdot}30,\ +1{\cdot}72;\ -2$$

$$y = +1{\cdot}15,\ +1{\cdot}85;\ 0.$$

(To be concluded.)

Cost of Sewage Treatment at Leeds.—In the report of the Sewerage Committee of the Leeds Corporation for the year ended March 31st last, it is stated that the cost per 1,000,000 gallons of sewage treated at the Knostrop works was £2 2s. 5d., as against £1 16s. 7d. for the previous year. The increase of 5s. 10d. per 1,000,000 gallons was in the main accounted for by the stoppage of the sewage purification work during the thirty-two days of the municipal employees' strike, which, in conjunction with the diminished volume of flow caused by the absence of rainfall, had reduced the average total volume pumped and treated on the works by nearly 1,750,000 gallons per day. The total cost of running the sewage works for the year shows, however, a reduction of £500 when compared with the figure of the previous year.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in The Surveyor and Municipal and County Engineer, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News*, New York.

* By Reginald Ryves, Assoc.M.Inst.C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which notices have appeared in these columns: Buildings—Buxton £15,000, Portrush £17,140; housing and town planning—Kingstown £40,000, Wigan £27,165; roads and materials—Battersea £24,475, Beckenham £26,000, Hove £7,400, Reading £13,000, Wigan £11,881; sewerage and sewage disposal—Ammanford £18,500; water, gas and electricity—Sandiacre. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Bridlington T.C.—The council have approved the plans of the borough surveyor, Mr. E. R. Matthews, for a fisherman's shelter in the South Cliff Gardens.

Bulkington U.D.C.—It has been agreed to contribute £50 towards the reconstruction of the bridge over the Coventry Canal in Bedworth-road, the total cost of which will be upwards of £1,000.

Buxton U.D.C.—A scheme has been adopted for rebuilding the natural baths, at an estimated cost of £15,000.

Leeds T.C.—A site between Aire-street and the River Aire is to be purchased for the purpose of building a new electricity generating station.

Portrush U.D.C.—Consideration is being given to designs for a new town hall, public baths, technical school and underground lavatory, which are estimated to cost, collectively, £17,140.

HOUSING AND TOWN PLANNING.

Horwich U.D.C.—A scheme is to be prepared for the erection of fifty workmen's dwellings.

Kingstown (Co. Dublin) U.D.C.—Negotiations are in progress for the purchase of four sites for the erection of workmen's dwellings at an estimated cost of £40,000, and meanwhile the council are seeking to obtain sanction to a scheme for thirty-seven cottages at Sallynoggin, at an estimated cost of £7,900.

Mansfield Woodhouse U.D.C.—The surveyor, Mr. F. P. Cook, has received instructions to prepare a town planning scheme.

Nelson T.C.—The council have approved the scheme of the borough surveyor, Mr. W. Shackleton, for the erection of workmen's dwellings at Catlow.

Newport (Mon.) T.C.—The Somerton housing scheme is to be proceeded with at the earliest date possible.

Plymouth T.C.—A housing scheme involving the destruction of a large number of insanitary dwellings is being considered by the Housing Committee.

Truro R.D.C.—It has been agreed to proceed with a housing scheme at St. Just, where ¼ acre of land has been purchased for £50.—Regarding a site at Gerrans for housing, the clerk read a letter stating that for ½ acre the owner required £230 12s. 6d. The clerk also read a list of conditions, at the end of the reading of each of which several members uttered groans. Another owner wrote that he would sell ½ acre at the rate of £300 per acre. These offers were not accepted by the council.

Wigan T.C.—The council have adopted the scheme prepared by the borough engineer, Mr. A. T. Gooseman, for the erection of 138 workmen's dwellings on the Melverley-street site, and the making of the necessary roads in connection therewith, at an estimated cost of £27,165.

PARKS AND OPEN SPACES.

Leek U.D.C.—The surveyor, Mr. W. E. Beacham, has been asked to prepare a scheme for laying out Brough Park, with bandstand, pavilion, bowling green and shelter.

Manchester T.C.—Barlow Hall estate is to be acquired for the purpose of a public park and recreation ground, and a boating lake of 45 acres is to be constructed.

Mansfield Woodhouse U.D.C.—A scheme has been approved for laying out Yeoman Hills park, and the provision of a caretaker's lodge, at an estimated cost of £2,500.

Newcastle-on-Tyne T.C.—The Town Moor and Parks Committee are considering the question of providing a recreation ground in the Welbeck district of Byker.

ROADS AND MATERIALS.

Ammanford U.D.C.—A stone-crusher is to be purchased so that out-of-work men can be employed in taking stones from the River Amman.

Armagh C.C.—The council have referred to the Distress Committee a report by the county surveyor recommending a scheme for considerable works on main and local roads, towards which it is hoped the Road Board might be prepared to contribute.

Barry T.C.—Application has been made to the Road Board for a grant of £8,000 for the widening of Fort-road.

Battersea B.C.—The council are recommended by the Highways and Works Committee to carry out paving schemes at an estimated cost of £24,475, and to submit the matter to the Road Board for their favourable consideration.

Beccles T.C.—Steps are being taken with a view to making up the roads on the Grange estate.

Blackpool T.C.—The Highways Committee have approved a proposed scheme of the Road Board with respect to the road between Blackpool and Poulton. The board are in favour of the construction of a new road, at an estimated cost of £26,000, in preference to a scheme for straightening and improving, and they are prepared to make a contribution of £20,000. The details will be arranged with the county council by a small subcommittee of the Highways Committee.

Brampton R.D.C.—The surveyor, Mr. J. Mark, has received instructions to construct a new road, at an estimated cost of £243.

Cockermouth R.D.C.—The council have agreed to the suggestion of the county council that plans for the erection of new buildings adjoining county main roads, so far as the building line is concerned, should be submitted to the county surveyor before building operations are commenced.

Colchester T.C.—It has been decided to construct a 15-ft. roadway on St. John's Green.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, in a report on the tarring operations during the present season, states that 117,386 sq. yds. were tarred, at an average cost of 1·14d. per yard.

Frome U.D.C.—Plans are to be prepared for a scheme of street widening at Broadway, and for sewer extensions at Marston-road.

Hove T.C.—It is proposed to carry out several schemes of road improvement, at an estimated cost of £7,400.

Leeds T.C.—Purchases of property are to be made for the purpose of widening North-street, Beckett-street and Czar-street.

Lynton U.D.C.—A letter has been received from the county council stating that the Bridges and Main Roads Committee had had under consideration the question of building a new road to avoid Lynmouth-hill, and were of the opinion that a road through Bonnicott Wood was the most practicable. Before proceeding further, the committee considered that the landowners concerned should be approached with reference to the cost of the land. On seeing plan and a detailed estimate of cost, they would again consider the whole question with a view to obtaining a substantial grant from the Road Board. It was agreed to expedite matters as much as possible.

Newark T.C.—An agreement has been sealed for the reconstruction of certain main roads.

Newcastle-on-Tyne T.C.—A scheme has been adopted for widening North-road, between Clayton-road and the city boundary, at an estimated cost of £15,710, towards which the Road Board are prepared to grant £5,000.

Reading T.C.—In order to provide employment for men thrown out of work by the war the town council

[illegible] adopted a scheme of road widening which will [illegible] £13,000.

Saffron Walden T.C.—The tender of Mr. J. [illegible] at £18 has been accepted for making up [illegible] and it has been agreed to pave the east side of the path in Gold-street, for a distance of 395 ft., at an estimated cost of £50. The council decided to [illegible] a supply of [illegible] barrels of tar from the Bishop's Stortford gasworks at 10s. 6d. per barrel.

Ware U.D.C.—Considerable purchases of property [illegible] with a view to the widening of Star-street, towards which a contribution will be made by the county council.

Wells R.D.C.—A committee has been appointed to consider the schemes of road improvement which it is advisable to undertake in order to find work for the unemployed.

Wigan T.C.—The council have adopted a scheme prepared by the borough engineer, Mr. A. T. Gooseman, for repaving various roads with granite setts [illegible] at an estimated cost of £11,881.

Wigtownshire C.C.—The road surveyor to the Rhinns District Committee, Mr. W. K. Gibson, reports that he has received a further sum of £1,000, in addition to the grant of £8,500 and the loan of £16,500, free of interest, already announced, towards the cost of reconstructing and surfacing with tar 50 miles of the principal main roads in the district. Six miles between [illegible] have already been thoroughly [illegible] and surfaced.

Wokingham T.C.—The borough surveyor, Mr. C. W. Marks, has been asked to prepare plans for widening [illegible] and it has been decided to make up [illegible] road under the Private Street Works Act.

SEWERAGE AND SEWAGE DISPOSAL.

Ammanford U.D.C. Plans, sections and estimates of the cost of the scheme of sewerage have been approved. The cost is estimated at £18,500, and it was decided to promote a Bill in Parliament to secure the necessary authority and loan to carry out the scheme. The contribution of Ammanford towards the cost of the trunk scheme for the Amman Valley will be about £10,000 additional.

Dewsbury T.C.—It has been arranged to carry out the scheme for the extension of the Mitchell Laithes sewage disposal works by direct labour, under the supervision of the Sewage Disposal Committee.

Hartley Wintney R.D.C.—At a recent meeting of the council, Mr. Schultz referred to a visit paid by the consulting engineer (Mr. T. J. Moss-Flower), who met representatives of the Ratepayers' Association and certain members of the council. The engineer gave a thorough and lucid explanation of the scheme. It appeared that the matter was being tackled thoroughly, and that no more than was absolutely necessary was being done. In connection with the drainage scheme generally at Hartley Wintney, a proper and accurate plan ought to be prepared while the clerk of works was on the spot. Something ought to be arranged expeditiously, or else the council would have to administer the scheme without having any knowledge of the details. Mr. Schultz added that the work had been very well done. Every reasonable point had been thoroughly considered, due allowance having been made both for normal and abnormal conditions. The chairman agreed to the necessity for having the plans, and said he would advise the Sanitary Committee to take the matter in hand.

Norham and Islandshire R.D.C.—The council have instructed Messrs. Taylor & Wallin, civil engineers, of Newcastle-on-Tyne and London, to prepare a scheme of drainage for the colliery district of Scremerston. The scheme will be wholly by gravitation, and no pumping will be required.

Reigate R.D.C.—It has been decided to purchase a cesspool-emptying apparatus and night-soil van for the parishes of Walton-on-the-Hill and Kingswood, and a similar apparatus for the parish of Betchworth, at a cost of £226 each.

Thetford R.D.C.—The Local Government Board have written that, according to the report of their inspector, Dr. Copeman, East Harling, Feltwell, and Methwold were in an extremely unsatisfactory sanitary condition, and that the council had neglected their essential duty with respect to them. In accordance with the advice of the board the council last week resolved to appoint a temporary sanitary inspector.

WATER, GAS, AND ELECTRICITY.

Burnley T.C. A site of 23 acres is to be purchased for the reconstruction of gasworks and [illegible].

Frome U.D.C.—The council at their monthly meeting held on September 7th accepted the tender of Messrs. James Simpson & Co., Limited, of Westminster, S.W., for new pumps and suction-gas plant to be erected at their water pumping station at Egford, and have instructed Mr. F. W. Jones, their surveyor, to prepare plans for the installation of the [illegible].

Portrush U.D.C.—Owing to serious wastage of the water supply it has been resolved to purchase a waste water detection meter and stethoscope.

Saffron Walden T.C.—A nett profit of £839 was earned by the gas undertaking in the last financial year.

Southam R.D.C.—The council have instructed Messrs. Taylor & Wallin, civil engineers, of Newcastle-on-Tyne and London, to prepare a scheme and report upon a water supply for the parish of Southam, with an extension for supplying the adjoining parish of Long Itchington. The water will probably be taken from a well, and pumping machinery will be required.

Stroud U.D.C.—The surveyor, Mr. G. P. Milnes, has received instructions to prepare a scheme for water softening.

Wadebridge U.D.C.—The Electric Light Company offered to place 50-candle power lamps in place of [illegible]-candle power lamps at a reduction of 1s. per lamp per annum. It was decided that if the company were unable to supply the 60-candle power lamps, they should be asked to make a reduction of half a crown per lamp on the [illegible]-candle power lamps.

Wigton R.D.C.—A water supply is to be provided for Gilcrux and Greengill, at an estimated cost of £700.

MISCELLANEOUS.

Halesowen R.D.C.—The surveyor, Mr. G. H. Dellow, has received instructions to prepare plans for improvements in the rural district.

Newcastle-on-Tyne T.C.—A number of contracts have been passed in order to give employment to men out of work. These included contracts for the erection of a lodge at Armstrong Park, the acquisition of land for Scotswood Recreation Ground, extensions to the City Hospital at Walker Gate, the erection of a propagating house at Leazes Park, and others.

Sewage Scheme for Bulkington.—A sewage scheme is about to be carried out for the parish of Bulkington at a cost of £8,500.

Weymouth Municipal Works. — Weymouth has obtained an Act of Parliament for the carrying out of many important works of improvement, and in accordance with the directions of the Local Government Board they are to be expedited in order to provide employment during the winter and alleviate much of the distress resulting from the war. The first scheme to be proceeded with is a portion of the development of the backwater, a tidal estuary of 250 acres, by the construction of an embankment road across it towards which the Dorset County Council is finding nearly £14,000. This will provide labour for many hundreds, and the Weymouth Corporation is pushing ahead with it with all speed.

The Talbot Car in South Africa.—News has just arrived of a further Talbot win in the reliability trial organised by the Transvaal A.C. for the Schlesinger 100-Guinea Trophy. Over a course of 175 miles, which imposed a far more severe test than the motoring conditions of our own country, the winning Talbot car made a non-stop run, with the lowest petrol consumption in its class, and finished with a score of marks over 10 per cent ahead of its nearest competitor. It was entered and driven by its amateur owner, and competed in full touring rig, winning the Gold Medal in its class, besides the all-comers event for the Schlesinger Trophy contested by both private and trade cars—a fact which enhances the merit of the Talbot's performance. Notwithstanding a depleted staff the manufacture of Talbot cars is proceeding briskly to give prompt deliveries of all models for private or commercial motoring requirements.

PERSONAL.

Mr. William R. Maxwell, Engl. engineer and inspector of Dunfermline, has resigned.

Mr. H. Holmes, M.INST.C.E.I., borough engineer, Ilkeston, has been called in by the Elland Urban District Council to report on the future extensions at the sewage disposal works.

Mr. H. W. Wilson, surveyor to the Bulkington Urban District Council, has been appointed the council's inspector under the Housing Act at a salary of £45 per annum.

Mr. H. T. Mather, surveyor to the Surbiton Urban District Council, has received condolences from many quarters upon the death of his mother at the age of seventy-eight.

Mr. W. T. H. Northcote, a member of the town council, has been appointed borough surveyor of Exeter. He had previously tendered his resignation as a member of the council.

Mr. Thomas Aitken, road surveyor to the Cupar District Committee of the Fifeshire County Council, having asked for the services of an assistant in carrying out the large improvement scheme he has in hand, the committee have agreed to make application to the Road Board for the necessary authority, the appointment to be on such terms as the committee may consider advisable.

Mr. Albert D. Greatorex, borough engineer and surveyor of West Bromwich, as will be seen from our honours roll, entitled "Pro Patria," has achieved distinction by having no fewer than four members of his immediate staff in service with the Regulars or Territorials. Mr. Greatorex, it may be stated, is a member of the National Reserve, and would have been only too happy to head the list. Both of his sons are members of the O.T.C., but are too young for active service yet.

Mr. E. Holloway, engineer and surveyor to the Evesham and Pebworth Rural District Councils, the author of the paper on "Housing in Rural Districts," which appears elsewhere in this issue, took up his present position in 1908, since when he has been

Mr. E. Holloway.

actively engaged in housing matters. He has prepared six housing schemes for his councils, who have erected ninety-six cottages, and have another seventy in hand. The necessity for these dwellings arose from the growth of the market gardening industry and the condemnation and demolition of a large number of very old houses in the district. Mr. Holloway is waterworks engineer for the two councils, who have one of the most up-to-date schemes in any rural area, sixteen villages in their areas being supplied by a gravitation scheme from the Cotswold Hills, which are 10 miles away from some of the villages.

Mr. W. Lloyd Marks, surveyor to the Rhymney Urban District Council, last week completed forty years' service with the council. Born at Carmarthen in 1850, he commenced duty under the now Rhymney Local Board on September 3, 1874. During his term of office he has witnessed the entire growth of Abertysswg (a suburb of Rhymney), the addition of hundreds of houses to the town, the completion of a sewerage scheme, cemetery completed, and the erection of a number of houses under the Welsh Garden City scheme. During the present crisis he has rendered great assistance in the recruiting of young men for Lord Kitchener's Army.

The announcement is made that the old-established firm of Claridge's Patent Asphalte Company, Limited, are embarking upon the manufacture of slag tar-macadam for road construction. A separate company, Carmac Roads, Limited, with offices at Central Buildings, Westminster, and works in Bilston and Chatterley, Staffordshire, has been formed, and municipal and county engineers—among whom he is widely known—will be interested to learn that the firm have appointed as their representative Mr. George Mason. Mr. Mason's many friends will, we are sure, join with us in wishing him success in his new sphere of activity.

FOR OTHER ADVERTISEMENTS
See End of Paper.

COUNTY BOROUGH OF SMETHWICK.
BOROUGH SURVEYOR'S DEPARTMENT.

The Corporation invite applications for the appointment of Assistant in the Borough Surveyor's Office at a commencing salary of £120 per annum.

Candidates must be neat and expeditious draughtsmen, accurate surveyors and levellers, and have had experience in architectural works, including the preparation of working drawings, details, specifications and estimates.

Applications, accompanied by copies of not more than three recent testimonials, must be sent to me under seal, endorsed "Assistant," not later than Wednesday, September 30, 1914.

A. HOSKEN,
Borough Surveyor.

Council House, Smethwick.
September 9, 1914. (1,914)

METROPOLITAN BOROUGH OF PADDINGTON.
BOROUGH SURVEYOR'S DEPARTMENT.

The Council are prepared to receive applications for the appointment of a Third Division Clerk in the Borough Surveyor's Department, at a salary of £70 per annum, rising by annual increments of £7 10s. to £100 per annum. Competitors must be competent shorthand writers and typists, and must be able to undertake all clerical work relating to the branch to be dealt with of the Paving Department work, and prepare the wages sheets of the Department, &c. Preference will be given to candidates who are between 20 and 25 years of age, and who have had experience in a Borough Surveyor's Office. Forms of application, with list of duties and conditions of appointment, may be obtained from the undersigned (upon receipt of a stamped addressed envelope), to whom applications must be delivered on or before Saturday, the 19th day of September, 1914.

(By order)
W. F. ABBISS,
Deputy Town Clerk

Town Hall,
Paddington, W.
September 7, 1914. (1,910)

TEMPORARY ASSISTANTS required (War period) in Municipal Engineer's Office. Write, stating experience and salary required, Box No. 1,465, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (1,913)

TEMPORARY ASSISTANTS (2), in Clerk's and Surveyor's Department required by Ruislip-Northwood Urban District Council during period of war. Male or Female; salary £2 per week; typewriting, shorthand, accounts and general office work for Clerk Department; for Surveyor's Department, general routine of Municipal Surveyor's Office.—Apply, in writing, with testimonials, to the Clerk, Council Offices, Northwood, Middlesex. (1,912)

THE WAR.

MANUFACTURERS' ANNOUNCEMENTS.

Messrs. Lyood & Reed, Limited, Poplar, write as follows:—

We have noted with interest and approval the influence which is being exercised by the Press and others in favour of the adoption of British goods, and the campaign which has been commenced (and we hope will be) to the ultimate advantage of British industries generally.

But it is very necessary that every precaution should be taken that wrong conclusions (based on pure assumption, or the statements of interested parties having ulterior objects in view) should be avoided.

It has come to our knowledge that the statement has been made, or the impression exists, that this company is to some degree under German influence. In this connection we would state:—

(1) This company has carried on business in London for upwards of sixty years. We were established at Millwall prior to 1854, and a few years later we moved to the site of our present premises, which, with the progress of years, have been enlarged and improved.

(2) There is not a single German connected with the company, either as shareholder, director, or employee. All are British born, bred and educated, with the exception of a few experienced Italian asphalters who are employed for special work, which plan is adopted by all the responsible houses in the asphalt trade.

(3) There is not a penny of German or other foreign capital in this company, the whole of the shares being held by English-born men and women resident in this country. Further, neither this company nor any member thereof has any connection with German or other foreign concerns.

(4) For many years past we have been contractors to H.M. Government for various materials, such as roofing felt, hair felt, asphalt, &c., and for the years 1910-11-12 we were successful in securing the War Office and Admiralty contract for asphalt work, the execution of which necessitated the admittance of our representatives and workmen to practically every fortification and depot of the War Office and Admiralty in the British Isles where our work was required, and to which foreigners are not admitted. This contract was given to us after the usual exhaustive inquiries in regard to the constitution of our company had been made by the War Office authorities.

(5) All goods supplied by us are manufactured here at our works in Poplar.

Possibly your extended experience of our house in itself will substantiate what we are here saying, and doubtless there are many architects, surveyors and builders, some of whom (although very probably now retired) have done business with us over half a century ago.

In conclusion, it might be pertinent to add that on an appeal issued to our factory employees by our managing director (who, we believe rightly, held the view that the seriousness of the present situation had not been fully recognised by at least some of our workpeople), several of our single employees have enlisted, the percentage of acceptances being over 80 per cent of the applicants. Their places are being kept open for them, but in the meantime will be filled by married men, and it may not be necessary for us ultimately to dispense even with the latter's services.

"Ironite," we are asked to point out, is another production which is entirely British made and British owned, being manufactured by Messrs. Archibald Kenrick & Sons, Limited, of West Bromwich. Ironite, it is claimed, will render the most porous concrete and brick work absolutely waterproof against heavy water pressure, and can be applied to existing structures direct without any mixing with cement. It is also being largely used for coating flat roofs in place of asphalt, and comes out at less than half the cost. In regard to Ironite flooring, this, the Ironite Company, Limited, 1 Victoria-street, S.W., state, is the toughest and most wearproof floor on the market. The firm keep large stocks on hand, both of waterproofing and flooring, and can give immediate delivery.

LOCAL AUTHORITIES AND THE WAR.

The all staff of the electricity department of the Marylebone Borough Council, numbering 200, have been sworn in as special constables.

Richmond (Surrey) Town Council have resolved to pay employees on service full wages less the pay received by them from the Government, and have also decided that their appointments shall be kept open.

The Finance Committee of Heywood Town Council have unanimously decided to recommend that the wages of corporation employees called to the colours shall be paid in full, after deduction of service allowance.

The motor 'buses of the Coventry Corporation, which were put on the streets for the first time this summer, are being taken over by the Government, and will be sent to Aldershot after they have been stripped of their bodies.

Tavistock Urban District Council will keep open the places of any of their employees desirous of serving their country, and will pay the wives of all married men the difference between the service pay and the usual pay under the council.

Northallerton Rural District Council have agreed to grant leave of absence to the surveyor, Mr. T. G. Easdale, and the medical officer in the event of their services being required in connection with Red Cross work, and to pay their salaries.

Hexham Urban District Council have resolved that all employees of the council serving with the Army, Navy or Territorial Forces during the war shall be paid the difference between their service pay and their full wages when in the council's employment, and that they be guaranteed their situations at the end of the war.

All officers and servants in the employment of the Halifax Corporation who join, or have joined the Navy, Army, Reserve, or Territorial forces will be granted leave of absence, and the corporation have decided to provide for the payment to them, or to their representatives or nominees during their absence from civil duty, their full salary or wages, less the deduction of the amount payable by the Government as pay allowances.

The General Purposes Committee of the Ossett Town Council have passed a resolution that all employees on active service shall be paid at the following rates as long as the war lasts, and their places kept open for them—viz.: Single men, 7s. 6d. per week; single men with dependants, 12s. 6d. per week; married men, 12s. 6d. per week, and 2s. 6d. per week for each child. This is the minimum scale adopted, and a sub-committee has been formed to increase these amounts if necessity arises.

A letter which Mr. W. J. Hadfield, surveyor of highways and deputy city surveyor of Sheffield, has written us makes it clear that the apparent disinclination of the labouring classes to respond to Lord Kitchener's "Call to Arms," noted by the contributor to our weekly feature "Things One Would Like to Know," does not extend to the employees of the Sheffield Corporation. Mr. Hadfield says: "I do not know what the experience of other corporations has been, but I would like to tell you that more than 150 of the 1,400 employees of the highway department of the Sheffield Corporation have already joined the Army, and others are joining. Many of these are married men. Nor does the highway department stand alone here. I have not the exact figures, but I know a still greater number of men have joined from the tramways department, and that large numbers have gone from the police and other departments."

Under date of Tuesday last, the hon. secretary of the Engineers' Club, Albert-square, Manchester, writes: "At an extraordinary general meeting of the club members held to-day, it was decided to form a 'Pals' Battalion for Kitchener's Army, such battalion to be recruited from those engaged in the works and offices of engineering concerns. A special committee was appointed consisting of Messrs. Daniel Adamson, H. T. Wilkinson, J. H. Stubbs, E. Simon, S. L. Pearce, G. Hughes, W. T. Anderson, E. T. Morland Johnson, E. L. Hill and Colonel Hollingworth. Every member of the club is asked to induce his friends, staff and employees to join, and to send their names as quickly as possible to me at the club. The particulars that should be given are: Name, in full; age; address; married or single; if married, number of children under sixteen years of age; occupation; name of employer; previous training, if any, in the Forces of the Crown.

WILTSHIRE MAIN ROADS.

THE QUESTION OF SUPERVISION

In The Surveyor of August 21st we printed a letter signed "One of the Ten," criticising certain remarks made by Mr. J. E. Docking at the meeting of the Wilts County Council on the subject of the upkeep and supervision of the county roads. On the appearance of Mr. Docking's letter, published in the *Wiltshire Times*, in the hope that it may lead to a fuller and wider discussion

Sir, I have received letters from several district surveyors, in addition to the letter in your last week's issue signed "One of the Ten," and all complain of my statement to the county council on August 4th, and all express doubts as to my authority for saying what I did. I readily accept the challenge of "One of the Ten" to prove my assertions, and to enlighten the ratepayers as to the unsatisfactory condition of the supervision and inspection of the main roads of the county.

"One of the Ten" makes several indiscreet accusations which have no foundation. I am accused that in my remarks to the county council I made attacks on an "honourable profession," on the thirteen "district surveyors," and, through them, the ten "rural district councils," and my answer to "One of the Ten" is that his statement is untrue. What I did attack is the present wasteful and rotten system of county administration of and maintenance and control of main roads, which will be discreditable to the county council if the system, or rather want of system, be allowed to continue. I presume "One of the Ten" is standing up for what he would call his rights. I have no objection to that, but I think that a public official who threatens to expose "wanton waste" (which is not in the district of "One of the Ten" of course) should not be ashamed of his name, and hide himself behind a *nom-de-plume*. The gravamen I have to answer lies in the following words, which I uttered to the county council: "The county surveyor had been complaining for a long time past that the supervision of these roads was entirely inadequate, and that the supervision of the men at work upon them was a mere farce." "It appears incredible," says "One of the Ten," "that Mr. Docking could be quoting Mr. Powell's opinion." It may be incredible or a revelation, but I shall show that every word I expressed is justified by Mr. Powell's official report. In order to exculpate himself and the other nine from my imputation or fault in connection with the system I complain of, "One of the Ten" quotes the report of the county surveyor for the year ending March 31, 1913, as follows: "Taking my last annual report as a basis, I am pleased to state that there is a steady improvement in the condition of the roads in the contract districts." This is not much of a testimonial, and leaves much to be desired, and is no answer to my strictures of the present system. The county surveyor's report for the year ending March 31, 1914, which brings us twelve months nearer, and which, it seems, "One of the Ten" has not yet seen, states: "The roads in some districts are good, but in several the conditions are only fair." According to this report the "steady improvement" ended for the time with 1913, and now the roads are good in some districts and only fair in several—not much for "One of the Ten" to boast of, considering these ten part-timers cost the county council, in contributing to their salaries, £697 a year. I will now quote from a report of the county surveyor to the Roads and Bridges Committee, dated June 16, 1914, which is not intended to circulate among part-time district surveyors, to prove the statements I made are justified up to the hilt. Mr. Powell says: "In each of these ten districts the main roads are supervised or inspected by the surveyors to the respective rural district councils, who have also the charge—in some instances—of a large mileage of district roads, together with other duties (such as surveyors under the Public Health Act, Sanitary Inspector, Dairy and Cowshed Act, and Petroleum Acts) to perform." In addition to those multifarious duties, these ten part-time gentlemen have to supervise and inspect 1,621 miles of district roads, averaging 116 miles apiece, and with the fag-end of their time also supervise and inspect 660 miles of main roads for the county council, averaging another 47 miles to each man, making a total average of 163 miles of road for each surveyor. And, further, four of these surveyors have charge of the following mileage of main roads and district roads: 201, 243, 264 and 281. So that it is practically impossible for these thirteen part-time surveyors, ten of whom are not officers of the county council, and not subject to the control of the county surveyor at all, and who cost the county over £1,300 a year—to inspect the main roads oftener than once in two or three weeks. Consequently, by this happy-go-lucky arrangement, which is satisfactory to everybody but the ratepayers who have to foot the bill, the surveyors go as they please, the men on the roads do the same, some contractors follow suit, and there is an entire absence of efficient control.

I do not blame those surveyors I criticise, neither do I blame the foremen who neglect their work. I blame the muddle-headed and stupid system which perpetuates and tolerates such a condition of things. I again quote the county surveyor: "There is insufficient instruction of a detailed nature given to the men employed on the main roads in respect to the various works they have to perform. I can only attribute the neglect to the fact that the officers have not sufficient time to give that instruction." The county surveyor again states: "I have previously stated it is physically impossible, under the present system, for the surveyors of either rural contract districts or district control districts to give the personal supervision and instruction which is necessary to the men engaged at work on the main roads." Again: "There is much difficulty in getting the men to work the time for which they are paid, and to my own personal knowledge they do not work the time stated on the labour sheets." Further, the county surveyor reports: "I have taken the matter up with the surveyors of the direct-control roads on many occasions, but I regret to say without satisfactory result."

I venture to think I have made a complete answer to the challenge of "One of the Ten" to prove from official documents every word I stated to the county council, and I hope the ratepayers who do me the honour to read this letter will conclude that, in the interest of economy, efficiency, and good administration, a drastic change in main roads supervision and control is an imperative necessity. I may add that the scheme of the county surveyor is a well-thought-out and practical plan, and is the plan adopted in forty-three out of fifty-eight counties throughout the land, which will not add a single penny to the ratepayers' burdens, and is a remedy for a state of things that would be fatal to the success of any industrial enterprise.—Yours, &c.,

J. E. Docking.

Westbourne-gardens,
Trowbridge.
August 18, 1914.

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited. *Liverpool Courier.*

Bristol City Engineer and Town Planning. In his report, covering the year ended March 25th last, Mr. Lessel S. McKenzie, Assoc.M.Inst.C.E., the city engineer, suggests that, the Local Government Board having now considerably simplified the procedure under the Town Planning Act, the Bristol Corporation might seriously consider the advisability of preparing a town planning scheme, especially in view of the necessity, which must shortly arise, of the extension of building operations.

Bituminous Materials for Road Construction.—We have been favoured with a copy of a new data form recently compiled by a special committee of the American Society of Civil Engineers on Materials for Road Construction and Standards for their Test and Use. It is the intention of the committee to distribute these forms to engineers having charge of bituminous surfaces and bituminous pavements, and it is anticipated that the accumulation of the data supplied will be of great value to the committee in connection with drafting conclusions regarding many fundamental details of construction and maintenance. The form referred to asks for a statement as to the length of work, the average width of metal, the dates of beginning and of completion and the method of construction, including information as to character and foundation, thickness of courses, kinds and quantities of road metal, and of bituminous materials used and approximate maximum grades.

WAVES IN ROAD CRUSTS.

[illegible] Paper dealing with the Science of Motorcars and of Method of [illegible] Construction, at the meeting of the Association of Civil Engineers, January 23rd and 24th last.)

Many [illegible] in the development of [illegible] according to [illegible] of waves in a certain [illegible] at right angles to the line of [illegible] where these waves have [illegible] appearance. This regularity has [illegible] been noticed to be harmonic waves, as distinguished from the more isolated [illegible] which result from an excess of [illegible] in the pavement at one end, or from a settlement of the pavement within a small area, or from [illegible] of that nature. Indeed the theory has been advanced that the harmonic waves referred to may be caused in many cases by harmonic percussion, such as may be set up when a moving [illegible] supported on flexible springs, rolls [illegible] in its path, and attains in its mass a certain rate of vibration. The vibration, transmitted through the wheels to the road surface, probably produces successive light and heavy stresses in each unit area, especially when the vehicle is self-propelled. The speaker does not feel that the theory of harmonic percussion is a solution for all harmonic waves, but admits that it is one possible solution of them under certain conditions. He has noticed the appearance of such waves adjacent to an obstacle in the path of traffic when they were not visible away from the obstacle, although the road surface and the road traffic were everywhere, within a reasonable radius, identical. On the other hand, they appear to occur at times when no obstacle such as would set up harmonic percussion is apparent, and in these cases it is quite probable that they are due to excess of bitumen in the road surface, or to improper grading of mineral aggregate for the traffic conditions to be met, or to an improper character of the bitumen, or possibly to some other cause. (Mr. W. W. Crosby.)

The speaker cannot accept the theory of harmonic waves caused by the impact of traffic, any the beautiful system of harmonics of the spheres, for, from practical experience, it has been learned in his department that it is very necessary indeed to watch the output of the mixer carefully. The proportions of stone, of sand, and of asphalt may be all right, but the first run of the mixer will be too rich in asphalt, the middle of the run will be just right, and the latter part of the run will be too lean; consequently, one would have a pavement composed of, for example, 12 per cent, 8 per cent and 4 per cent of asphalt, all from the same mixer, notwithstanding that the stone was weighed and measured carefully, as was the asphalt, before either was put in the mixer.

This mechanical failure is often overlooked. It caused so much trouble that the speaker was led to make a careful investigation of the run of the mixer, and it was found that in many cases the asphalt concrete which had been condemned as not being properly moved owed its lack of uniformity, not to the workmen who were in charge (they had done their duty faithfully and carefully), but to the machine.

In connection with the theory of harmonic waves, there was one very important point made by Mr. Washington which is worthy of more than passing notice—namely, the irregularities caused by improper rolling. The speaker has had considerable trouble in the past, even with water-bound macadam roads. When the causes of the so-called waves are carefully analysed, it will be found that the trouble lies not in the traffic, but in faulty construction. The first macadam roads built in the United States were rolled with heavy three-wheeled rollers. There never were any waves in those roads. Later, an endeavour was made to reduce the cost of construction, and to that end horse rollers were substituted for the heavy English steam rollers; still later, different types of steam rollers were used, and, last of all, the tandem roller was brought forward as the best. The speaker tried them, and had macadam roads with harmonic waves long before automobiles were used. The real reason for these waves, or hills and hollows, in the road may be found in the method of construction. If the base is not thoroughly compacted, not thoroughly rolled, and not brought to an even and uniform surface, then, if those waves do not appear at once, they will develop eventually. When to this wavy base is applied bituminous concrete which is not uniform in composition, two sets of waves—two sets of hills and hollows—will appear, not due to traffic, but to faulty construction.

Highway engineers should not try to dodge their responsibility for poor workmanship by charging it to motor vehicles or to the rhythm with which they travel over the highways when the fault lies in the manner of construction. This must be carefully [illegible]. Careless construction was one of the reasons for the failure of so many penetration roads. The speaker has had experience with penetration roads in which he was told that the distributing wagon had stood for a time at a certain point, and that the hump of bitumen seen on top of the road was due to the fact that the controlling valves were leaking.

In one case coming under the speaker's immediate observation he knew that the wagon had not stopped within 100 ft. of that particular point; therefore this explanation was evidently wrong; hence a series of investigations was made, whereupon it was found that the percentage of voids in the road varied greatly. Where the road was comparatively dense the bitumen appeared in humps on top of it, and disappeared entirely at a depth of 2 in., and where hollows appeared it was found that the bitumen had penetrated in many cases to the depth of 7 in. The same quantity of bitumen per square yard of surface having been applied, there was consequently a recurrence of the fat and lean bituminous mixture encountered in the output of the mechanical mixer. A careful analysis of numerous faulty spots, in both broken-stone and bituminous pavements, has convinced the speaker that the varying percentage of voids is a fruitful cause of many so-called failures; in other words, a lack of homogeneity in the mass is the real cause of the wavy surfaces so often seen. (Mr. R. A. Meeker.)

The speaker cannot say much about "harmonic waves" in asphalt or bituminous pavements, but readily agrees with what Mr. Washington has said regarding Mr. Crompton's ideas as to rolling. He believes that waves such as mentioned by Mr. Crompton might occur in some hard homogeneous material, but, with one as plastic as a bituminous pavement, such waves are likely to be due to two causes—lack of cross-rolling and lack of homogeneity of the material. Most highway engineers are familiar with the effect of cross-rolling, and the speaker believes that if roads generally were rolled cross-ways as well as longitudinally the regular waves would not occur as frequently. No doubt the uniformity of the material, or, in other words, the number of voids in it, has a very great influence on the evenness of wear; and the secret of obtaining a good road, other things being equal, seems to be the even distribution of voids throughout the material. (Mr. D. B. Goodsell.)

The speaker, in company with Colonel Crompton, examined one road on which there were more than 1,000 motor 'buses per day, and found a series of long waves, which occurred with great regularity throughout the length of the road. The speaker believes that improper rolling of the road and the compression of the material are the main factors influencing the formation of harmonic waves. Traffic further develops the harmonic waves due primarily to the vibration of the motor cars passing over them. During the process of rolling it will be noticed that the material rises in front of the front roller and pushes ahead to a certain extent, finally ceasing to move forward, at which time the roller goes over it. If examined, the road surface will be found to have a marked swell. Colonel Crompton has endeavoured to solve this problem by devising a machine with three sets of rollers instead of the ordinary tandem roller. (Mr. Washington.)

The writer thoroughly agrees with Mr. Meeker and Mr. Washington that the so-called "harmonic" waves are caused more by poor workmanship and materials than anything else. On Diversey Boulevard, Chicago, paved with bituminous concrete in 1911, at a section having a mixed traffic of about 5,000 vehicles per day, evenly divided as to direction, one side has pushed into these waves so that it has become exceedingly rough. The other side is quite smooth. This condition is apparent for only about 2,000 ft. The rest of the highway (several miles) is in perfect condition. It is very evident that defective material or workmanship, or both, have been the cause of this. (Mr. P. E. Green.)

SEWAGE PURIFICATION AT MANCHESTER.

RIVERS COMMITTEE'S REPORT.

The Manchester Rivers Committee have issued their report on the work of the department during the year ended March 24th last. The committee are well pleased with the adoption of all such efforts as the owners of Manchester and their neighbours have expressed with the purifying of the city's sewage. Work is carried on at Davyhulme, the main works at Davyhulme, the Worsley works, a Cheadle-road Hardy, the Moss Side works at Birchfield, which are now concerned with the treatment of clean water only, and the Gorton works at Gorton.

The total income on the rates in respect to the work of the committee during the year under review was £120,011. To this amount a sum of £37,756 was required for the upkeep of the Davyhulme, Withington, Moss Side and Gorton sewage works, and for general rivers work, comprising the cleansing duties of the town hall, the cost of income and various other expenditure, and contributions to the Mersey and Irwell Joint Committee, &c. The balance, amounting to £82,255 was applied in the payment of interest on loans, and repayment of debt on the capital account of 30 sewage sewers throughout the whole of the city, and on the perfection of plant at the various sewage works.

The committee note with satisfaction that during the year there has been a further increase, as compared with previous years, in the amount of purification effected by the treatment of sewage at Davyhulme. While, as previously stated, the possibilities of nuisance arising from the canal are not increased by the treatment of the present effluent, the average effluent leaving the works does not meet the requirements of the Mersey and Irwell Joint Committee, nor can it be considered satisfactory. Extensions and alterations of the purification plant have, therefore, been under consideration for some considerable time, and a scheme has been prepared in outline. The details of certain portions of the scheme are receiving the active attention of the engineers, and work in connection with the alteration of the storm beds is being actually proceeded with at the present date.

ROAD WORK IN BRISTOL.

During the twelve months covered by the last annual report of the city engineer, Mr. Lessel S. McKenzie, Assoc.M.Inst.C.E., just over 141 miles of macadam roads in Bristol were tar-sprayed, with very satisfactory results, and although the number of loads of slop, &c., carted off the roads amounted to 65,076, being 3,437 in excess of the total for the preceding year, this was 17,431 loads less than the total for the year previous to the introduction of tar-spraying.

The areas of wood paving relaid have, as far as possible, been laid with deal blocks creosoted under pressure, "this class of wood paving," observes Mr. McKenzie, "being far less noisy than the Australian hard wood hitherto largely used in Bristol, and at the same time maintaining a much more even surface, and being less susceptible to expansion and contraction."

The city engineer adds that further experimental lengths of bituminous macadam have been laid, and that, although the initial cost is heavy, this method of construction, so far as can be judged at present, appears to provide a road capable of carrying present-day traffic, including motor 'buses, without serious damage to the surface. The bulk of the heavy traffic to the Royal Show ground passed over a 1 in. bituminous carpet laid in Pembroke-road, without any appreciable damage being done.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

B. WYANE,
39 Victoria-street, S.W. *Secretary.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. PICKERING, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.
92 Victoria-street,
Westminster, S.W.

ROYAL SANITARY INSTITUTE.

YORK MEETING.

On Saturday, October 24th, at a meeting of the Royal Sanitary Institute at York, Mr. F. W. Spurr, the city engineer, will open a discussion on "The Bacteriological Examination of the York Sewage."

In the afternoon visits will be made to the pumping station at Fulford, the sewage works at Naburn, and the new Earswick model village.

The 58th course of lectures and demonstrations for sanitary officers will commence on Monday, September 21st.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ASSISTANT SURVEYOR. September 12th. Swansea Rural District Council. £120 per annum. Mr. E. Harris, clerk, Alexandra-road, Swansea.

INSPECTOR OF NUISANCES. September 12th. Alford Urban District Council. £78 per annum.—Mr. T. N. Loy, clerk.

ASSISTANT SURVEYOR. September 12th. Devon County Council. £150—£200.—Mr. R. M. Stone, county surveyor (No. 1 Division), The Square, Barnstaple.

TEMPORARY SURVEYOR'S ASSISTANT.—September 14th.—Aylesbury Urban District Council. £75 per annum. Mr. W. Harold Taylor, engineer and surveyor.

BUILDING INSPECTOR.—September 14th.—West Ham Town Council. £150—£200 per annum. Mr. H. W. Greaves, town clerk.

CLERK OF WORKS.—September 14th.—Aberystwyth Rural District Council. £3 3s. per week.—Mr. H. Hughes, clerk, 8 Market-street.

MOTOR FIRE-ENGINE DRIVER. September 14th.—Ossett Town Council. 30s. per week, with house and allowances.—Mr. H. Holmes, borough surveyor.

ENGINEERING ASSISTANT.—September 14th.—Watford Urban District Council. £80—£100 per annum.—Mr. D. Waterhouse, engineer.

SURVEYOR AND ENGINEER.—September 14th.—Wellingborough Urban District Council. £350 per annum.—Mr. J. T. Parker, clerk, 29 Church-street, Wellingborough.

ELECTRICAL ENGINEER.—September 15th.—Corporation of Swansea. £500 per annum.—Mr. H. L. Coath, town clerk.

DIVISIONAL SURVEYOR.—September 15th.—West Suffolk County Council. £145 per annum.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

BOROUGH SURVEYOR.—September 15th.—Corporation of Swansea. £500 per annum. Mr. W. Lang Coath, town clerk, Guildhall, Swansea.

INSPECTOR OF NUISANCES.—September 15th.—Matlock Bath Urban District Council. £30 per annum.—Mr. F. W. Gill, clerk.

TEMPORARY ENGINEERING ASSISTANT [illegible] Mr. [illegible] Town Hall.

ASSISTANT [illegible] Mr. [illegible]

GENERAL FOREMAN [illegible] Mr. [illegible]

ASSISTANT IN SURVEYOR'S OFFICE [illegible] Mr. [illegible]

SURVEYOR [illegible] Mr. [illegible]

INSPECTOR OF NUISANCES [illegible] £80 x £100 Mr. M. H. Truscott, clerk, The Square, Penryn.

ASSISTANT SURVEYOR [illegible] Mr. [illegible]

SURVEYOR [illegible] Mr. [illegible] Thomas, clerk.

CHIEF DRAUGHTSMAN [illegible] £300 £20 per annum. Mr. [illegible] Hall, [illegible], City Hall, Corporation Street and W.C.

BOROUGH ENGINEER AND SURVEYOR [illegible] £1,100. Mr. [illegible], town clerk, Town Hall, Salford.

ROAD FOREMAN [illegible] Town Council, [illegible] to £2 10s. per week.—Mr. E. Lovegrove, borough engineer and surveyor, Town Hall, 90 Southwood-[illegible], Highgate, N.

CLERK OF WORKS [illegible] Rivers Committee [illegible] Mansion Corporation, [illegible] per week. Chairman, Town Hall.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ST. HELENS.—October 31st. Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HALIFAX.—September 14th.—For the erection of a [illegible] and alterations to existing buildings, for the corporation.—Mr. J. Lord, borough engineer.

EDINBURGH.—September 14th.—For the reconstruction of a tenement, for the corporation.—Mr. J. A. Williamson, Public Works Office.

ABERYSTWYTH.—September 14th.—For the construction of a covered reservoir and the laying of 6-in., 5-in., 4-in., and 3-in. cast-iron water mains, together with valves, hydrants, and other castings, and the laying of 15-in. cast-iron sea outfall, for the rural district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

CARLISLE.—September 14th.—For laying 1,200 yds. of 3-in. water main, for the rural district council.—Mr. F. Barker, 7 Victoria-place, Carlisle.

DUNDEE.—September 15th.—For the enlargement of a school, for the School Board.—Mr. J. H. Langlands, architect, 31 Murraygate, Dundee.

DEWSBURY.—September 16th.—For alterations to buildings and erection of conveniences, for the corporation.—Borough Surveyor.

MAIDSTONE.—September 16th.—For the repair of a bridge, for the rural district council.—Mr. T. A. Busbridge, surveyor.

BRADFORD.—September 16th.—For the erection of eight workmen's dwellings, for the corporation.—Mr. F. Stevens, town clerk.

EDINBURGH [illegible] cottage [illegible] Mr. [illegible] Williamson, Public Works Office.

NEWPORT.—September 16th. For the erection of a school clinic and [illegible] street, Newport, Isle of Wight.

WAKEFIELD [illegible] Messrs. Simpson & Firth, architects, Southgate Chambers, Wakefield.

BRISTOL.—September 17th.—For the erection of a school (builder's and plumber's work), for the Education Committee.—Mr. W. S. Skinner, architect, 27 Orchard-street, College-green, Bristol.

DERBYSHIRE.—September 18th. For the erection of two schools, for the Education Committee.—Mr. G. H. Widdows, architect, County Offices, St. Mary's Gate, Derby.

RHYL.—September 18th.—For the reconstruction of the amphitheatre, for the urban district council.—Mr. F. B. Smith, architect, Seacroft, Highfield Park, Rhyl.

CHESHIRE.—September 19th.—For the erection of a school at Nantwich.—Mr. H. Beswick, county architect, Newgate-street, Chester.

GLASGOW.—September 19th.—For alterations at a hospital, for the corporation.—Office of Public Works, 64 Cochrane-street.

ST. GERMANS.—September 19th.—For the erection of a bridge, for the rural district council.—Mr. H. A. Hosking, surveyor, Landrake.

CAMBRIDGE.—September 19th.—For the erection of cottages, for the corporation.—Borough Surveyor.

YORK.—September 21st. For the [illegible] weights and measures offices, for the corporation.—Mr. F. W. Spurr, city engineer, Guildhall.

COVENTRY.—September 21st.—For the construction of workmen's dwellings, for the corporation. — Mr. J. E. Swindlehurst, city engineer and surveyor.

ILFORD.—September 22nd. For the erection of a sanatorium, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

LLANFYLLIN.—September 22nd.—For the erection of eight cottages, for the rural district council.—Mr. T. Edwards, clerk.

MONMOUTH.—September 22nd.—For the erection of a school, for the Education Committee.—Mr. J. Bain, County Council Offices, Newport.

TEWKESBURY.—September 22nd.—For the erection of porter's lodge, engine-house, mortuary, and other buildings, for the Joint Hospital Board.—Mr. J. Villar, 5 Essex-place, Cheltenham.

MANCHESTER.—September 23rd.—For the erection of a valve-house, for the Gas Committee.—Mr. F. A. Price, superintendent, Gas Department, Town Hall.

KIRKCALDY.—September 26th.—For the erection of a school, for the Kirkcaldy and Dysart School Board.—Mr. W. Williamson, Royal Bank Buildings, Kirkcaldy.

SOUTH MIMMS.—September 29th.—For the erection of twelve cottages, for the rural district council.—Mr. G. Simcox, surveyor, Bearwood, Potters Bar.

CHISWICK.—September 30th.—For the construction of a brick and concrete culvert, for the urban district council.—Mr. E. Willis, surveyor, Town Hall.

COLWYN BAY.—October 8th.—For the erection of a refuse destructor, with steam boiler and auxiliary machinery complete, for the urban district council.—Mr. E. M. Lacey, consulting engineer, 12 Victoria-street, Westminster, S.W.

WARRINGTON.—October 9th.—For the erection of a school, for the Education Committee.—Mr. J. M. Murray, secretary, Education Office.

LANCASHIRE.—October 10th.—For the erection of a police station, for the Standing Joint Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

BARNACK.—No date.—For sinking a well, laying water mains, and building engine-house, for the rural district council.—Mr. R. M. Entwisle, clerk, Stamford.

Iron and Steel.

MANCHESTER.—September 15th.—For the supply and erection of steel storage shelving, for the Tramways Committee.—Mr. J. M. McElroy, general manager, corporation tramways, 55 Piccadilly, Manchester.

MANCHESTER.—September 15th.—For the supply of 130 tons of cast-iron water pipes, for the Waterworks Committee.—Secretary, Town Hall.

Roads.

DERBYSHIRE.—September 14th.—For roadways and pathways at Walton sanatorium, for the county council.—Messrs. W. H. Ward, architects, Paradise-street, Birmingham.

BLACKBURN.—September 14th.—For making up certain streets, for the corporation.—Mr. W. Stubbs, borough engineer.

EDMONTON.—September 14th.—For the execution of private street improvement, for the urban district council.—Mr. C. Brown, engineer and surveyor.

HAMBLEDON.—September 15th.—For making up a private street, for the rural district council.—Mr. S. B. Hasell, surveyor, High-street, Bramley.

LEWISHAM.—September 15th.—For making up a street, for the borough council.—The Borough Surveyor.

ILKLEY.—September 15th.—For the supply of limestone, granite, and tar-macadam, for the urban district council.—The Surveyor.

ACTON.—September 15th.—For work of widening and resurfacing, for the urban ditrict council.—The Surveyor.

LEEDS.—September 16th.—For making up certain streets, for the corporation.—Highways Department, 155 Kirkstall-road, Leeds.

NORTH RIDING.—September 19th.—For the supply of granite, slag-macadam, annealed slag screenings, and slag rejects, for the county council.—Mr. W. G. Bryning, county surveyor, County Hall, Northallerton.

STEVENAGE.—September 21st.—For the supply of 800 tons of clean chippings and dust, and broken Guernsey, Leicester, or other granite, for the urban district council.—Mr. W. O. Times, clerk.

HALE.—September 21st.—For making up a street, for the urban district council.—Mr. T. Blagburn, surveyor.

ANDOVER.—September 22nd.—For kerbing and paving works, for the corporation.—Mr. R. W. Knapp, borough surveyor.

ROMFORD.—September 22nd.—For works of road improvement, for the urban district council.—Mr. H. T. Ridge, surveyor.

WEST HAM.—September 22nd.—For making up Canning road, for the corporation.—Borough Engineer.

RHONDDA.—September 22nd.—For making up certain streets, for the urban district council.—Mr. E. H. Barber, engineer and surveyor, Pentre.

CROYDON.—September 24th.—For making up a certain road, for the rural district council.—Mr. R. M. Chart, surveyor.

LAMBETH.—September 24th.—For the construction of road foundations, for the borough council.—Mr. Henry Edwards, borough engineer.

RUNCORN.—September 28th.—For making up with tarred macadam certain streets and passages, for the rural district council.—Mr. R. Garnett, surveyor, Bold-street Chambers, Warrington.

GATESHEAD.—September 29th.—For paving work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

CHISWICK.—September 30th.—For making up a street, for the urban district council.—Mr. E. Willis, surveyor.

TANGIER.—October 3rd.—For road construction, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

RELIEF WORKS.

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TELEGRAMS & CABLES: VERMEHRICO, LONDON.

Sanitary.

CO. KERMOUTH.—September 12th.—For laying 2,000 yds. of sewers and constructing manholes and flushing chambers, for the rural district council.—Mr. J. B. Wilson, Greenart Villa, Cockermouth.

DOWNPATRICK.—September 12th.—For the construction of a sewer, for the rural district council. Mr. R. L. Morrow, clerk.

ACTON.—September 15th.—For the supply of coal [illegible] for the sewage pumping works.—The Surveyor.

ARDSLEY.—September 15th.—For laying about 600 [illegible] of stoneware pipe sewers and storm [illegible] for the urban district council.—Mr. E. B. [illegible], Council Offices, Tingley, near Wakefield.

BROMSGROVE.—September 15th.—For the construction of [illegible] yds. of 9-in. stoneware pipe sewers, with manholes, ventilating [illegible] and other works, for the rural district council.—Mr. Robert Grace, 57 Waterloo-road, Birmingham.

BOURNEMOUTH.—September 16th.—For the [illegible] of surface water drains, for the corporation.—Mr. F. W. [illegible], engineer and surveyor.

WELLINGTON.—September 16th.—For the construction of [illegible] sewers, for the urban district council. Mr. J. W. Littlewood, clerk.

BLYTHING.—September 19th.—For the removal of house refuse and cleansing privies, for the rural district council.—Mr. C. W. Flaxman, inspector, Holton, Halesworth, Suffolk.

BURNLEY.—September 19th.—For laying earthenware pipes [illegible] and emptying cesspools, for the rural district council. Mr. H. Pritchard, engineer.

HEMEL HEMPSTEAD.—September 21st.—For the collection of house refuse and emptying closets, for the rural district council.—Mr. T. H. Lightbody, surveyor, 20 Marlowes, Hemel Hempstead.

HARPENDEN.—September 22nd.—For the construction of about 1,000 yds. of 12-in. and 9-in. pipe sewers, for the urban district council.—Mr. John H. Leverton, surveyor, Public Hall, Harpenden.

SEATON DELAVAL.—September 22nd.—For scavenging the district, for the urban district council.—The Surveyor.

WATFORD.—September 22nd.—For sewer extension, for the rural district council.—Mr. E. Lailey, engineer, 9 Market-street, Watford.

HAVANT.—September 28th.—For removing, washing, and replacing 2,000 cub. yds. of filtering material in the filter-beds, for the urban district council.—Mr. A. E. Stallard, surveyor.

BANBURY.—October 3rd.—For the construction of about 1 mile of 18-in., 15-in., and 9-in. cast-iron and stoneware pipe sewers, with manholes, storm overflow chamber, erection of engine-house, refuse destructor-house, and other works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

BISHOP AUCKLAND.—October 5th.—For the supply of disinfectants, for the rural district council.—Dr. Pendred, medical officer of health, 9 Cradlock-street, Bishop Auckland.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ASHFORD.—For the construction of an ejectment station with pneumatic ejectors and air-compressing plant, 240 yds. of 6-in. rising main, and a set of sewage purification works, for the West London District School Managers.—Mr. Arthur Martin, Westminster, S.W.

S. Kavanagh & Co., Surbiton Hill, S.W.	£2,480
Goze & Sons, Limited, Walton-on-Thames	2,290

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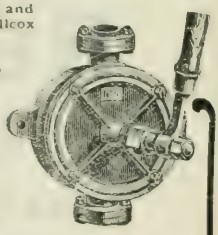

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From April 13th to 25th, 1915.

Applications for space should be addressed to C. S. MASON, 24 Bride-lane, Fleet-street, E.C.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Old Highways. The question whether an old highway is or is not repairable by the inhabitants at large is one which is sometimes very difficult to answer. This is illustrated by two cases decided by the House of Lords during the present year. One of these was concerned with Cottimore-lane, Walton-on-Thames, and the other with the Lower Sandgate-road, Folkestone (THE SURVEYOR, February 27th and March 27th last). Cottimore-lane was originally set out as a private bridleway and footpath under an inclosure award, as far back as 1801 for the use of the occupiers of certain allotments. In course of time, as was perhaps natural, these occupiers made use of the road as a cartway, and gradually it got to be used by the public generally for all purposes. It was admitted that by 1864 the road had become a public highway, but inasmuch as there was no evidence that it had ever been formally dedicated under sec. 23 of the Highway Act, 1835, it became necessary to ascertain whether the public rights had accrued before or after the passing of that Act. As to this, there appears to have been some conflict of evidence, but the Courts decided that it had not become a public highway at the time of the passing of the Act. This, of course, determined the issue on the question of fact. Two points of law, however, were raised by the plaintiff (a frontager on the road)—viz., (*a*) That, having regard to the lapse of time, formal dedication might be presumed, and (*b*) in the alternative that section 23 applied only to roads which had been originally and intentionally dedicated as public highways. In support of the first contention the case of *Leigh-on-Sea Urban District Council v. King* (65 J.P., 243) was cited. In that case it was held that such dedication might be presumed. But the facts were very different from those in the Walton case, the road having been substituted for an old public highway, and having, moreover, been repaired by the parish, whereas in the Walton case the road had always been repaired by the adjoining owners, and never by the highway authority. There appears to be no authority for the second contention, and at all events both these points were overruled, and the road was held not to be repairable by the inhabitants at large. It is interesting to note that this decision of the House of Lords affirmed the decisions of all the Courts below from the magistrates to the Court of Appeal.

It is not always that such unanimity is met with when a case goes to the highest tribunal. That was the case in the Folkestone case, to which we will now refer. The Lower Sandgate-road was constructed in the year 1824 by the then Earl of Radnor. There was a gate across the road, with a toll box, and notice boards were affixed inscribed "Private road," and setting out particulars of the tolls which were levied on horses and vehicles, but not upon foot-passengers. These tolls, we gather, are still levied. There was no evidence that the road was required for any other purpose than for the use of the occupiers of houses which were erected on both sides of it on building plots leased by the Earl. It had, however, been used to a certain extent by other inhabitants from the year 1831. Before 1835 it had got into a bad state of repair. Afterwards it was repaired by the Earl or his lessees—never by the local authority—nor had it ever been formally dedicated. Here again the decision turned upon the question, When did the public rights accrue? And again the evidence would seem to have been conflicting, since the Court of Appeal (by a majority of two to one) held that the road had become a public highway before 1835, whereas the House of Lords came to the opposite conclusion. Obviously there must always be more or less difficulty in obtaining clear and reliable evidence as to the precise date of the commencement of public user in the case of old roads, and of course that difficulty will increase as time goes on with the inevitable passing away of the "oldest inhabitants."

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Then and Now. In welcoming to Brussels in 1910 the Second International Road Congress, the Belgian Minister of Public Works, M. Delbeke, said: "There was nothing that was more important to the progress of the world than good roads, for as soon as roads appeared barbarism disappeared, and the conditions of life improved immediately." Well, Germany has roads, even good roads, and had them long before present methods of road making were thought of, but to-day, unhappily, few non-Germans, and certainly no Belgian, would admit that her primitive barbarism has entirely disappeared. In a similar strain to that of M. Delbeke, the Japanese delegate, Mr. Inuzuka, remarked: "Since Japan had entered into the comity of civilised nations she had endeavoured, and was still endeavouring, to improve the means of communication, which was the bond of union of all peoples, but they were still far from the end of their task." Far, indeed, as regards the realisation of the idea that ready means of communication are in themselves a bond of union between nations! Moreover, the terrible irony of the present situation is still further emphasised by a statement which appeared in our correspondence column a fortnight ago to the effect that the recent bloody battle of Mons must have taken place on the very "doorstep" of a well-known Belgian quarry which is one of Belgium's principal sources of supply of road-making stones, and which was visited by the delegates to the Brussels Congress. Major W. W. Crosby and Sir George Gibb, who

[illegible] at the Congress made no reference to the international aspect of road communication, but treated the subject from the point of view of national welfare and internal development. Sir George Gibb declared that "good roads formed the basis of national prosperity." Nevertheless, the military position in Europe just now makes us think that the absence of the presence of good roads in particular localities may conduce to the protection, possibly even to the actual preservation, of a nation's existence. On the other hand, and showing the strict impartiality of Nature and her sublime indifference even to the greatest political and moral issues, it has been stated that the continuance of the rapid and successful advance of our Russian ally towards Berlin might be somewhat impeded and retarded by the marshy character of much of the ground she has to traverse.

Most of the above facts and reflections may seem, perhaps, rather discouraging and disillusioning to those who, like ourselves and our readers, are earnest advocates of good roads, and in one way or another are engaged in promoting them. There can, however, be no disillusion if there has been no illusion, i.e., that is, no [illegible] made the mistake of expecting from good roads a larger contribution to the sum of human happiness than they are at present able to make, owing to the imperfection of the race and of organised society, and especially to the absence of any authoritative international compact, such as no single nation, however powerful, shall with impunity disregard as a mere scrap of paper. "Ex Sorore Carda" [illegible] even of the most cautious thinkers say there is reason to hope—that from this cataclysmal war there will emerge a better state of things which, *inter alia*, shall give good roads the opportunity of bringing their benefits to mankind.

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Water Examination.

As long ago as 1903 a Special Committee was appointed by the Royal Institute of Public Health to consider the methods employed in the bacteriological examination of water in temperate climates, and to draw up a scheme of uniform procedure for adoption in this examination. The value of the work accomplished by the committee is indisputable, but having regard to the very great progress that has been made in the science of bacteriology during recent years another committee was appointed in March last for the reconsideration of the whole subject. The report of this committee is now before us, and is a document of such authority as to merit the close attention of all who are interested in the subject. In regard to the collection of samples, the committee, while suggesting no special precautions beyond those generally recognised, emphasise the desirability of conducting the examination as soon as possible after the sample is taken, and the necessity of packing it in ice unless this can be done within three hours. The report carefully refrains from laying down hard and fast rules as to the number and character of the tests to be employed, a matter in regard to which the bacteriologist must largely be guided by circumstances. It is pointed out, however, that in all cases the number of bacteria present in the water and the number of *bacillus coli* should be estimated. Again, the committee do not think it is practicable to lay down any fixed standards of purity to govern all cases, and merely feel justified in stating that the further a water departs from the standard of purity, "no lactose+indol+*B.Coli* in 100c.c.," the greater is the suspicion attaching to it, unless the local conditions and circumstances are such as to exclude the possibility of undesirable pollution. The report concludes with some interesting observations regarding the creation of unnecessary alarm by the wording of bacteriological reports. Any bacteriological statement must be interpreted in the light of local conditions and possible sources of contamination, and the committee are consequently well justified in their conclusion that, in the case of waters of unknown history, any statements made should be of a guarded character, and that, generally, waters should not be condemned unconditionally without accurate knowledge of all the local circumstances.

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The Progress of Cremation.

It was not until the passing of the Cremation Act, 1902, that burial authorities were empowered to provide and maintain crematoria, and the number of such institutions that have since been established is exceedingly small in comparison with the importance and urgency of the sanitary reform which that measure rendered possible. The Act cannot be said to have been passed with any undue haste, for the Cremation Society of England had previously been carrying on its work, both practical and propagandist, for nearly thirty years before it was enacted. This society is the pioneer of the cremation movement, and by practically demonstrating the advantages and facilities of this method of disposing of the dead has now overcome much of the prejudice and opposition with which it was confronted in its early years. In their recently-issued report for the year 1913 the council state they fully realise that it will take time and the pressure of circumstances to compass the abandonment of a custom so old as burial, and so intimately associated with current social and religious views. It is, indeed, difficult to induce the great bulk of the community to consider the question at all, especially when persons interested are at great pains to conceal or to gloss over the insanitary and revolting conditions that prevail [illegible] the surface in overcrowded cemeteries and graveyards. The reasons which may be urged in favour of cremation as a means of disposing of the dead are many, and range from mere considerations of economy to the avoidance of the grim possibility of being buried alive. It is well, however, that local sanitary authorities should learn to view the question from the point of view of the public health. Cremation effects in a little over an hour that which takes years to accomplish if the body is buried. The process of cremation absolutely prevents all possibility of pollution of water or contamination of air, whereas burial is always noxious and sometimes dangerous. If these facts are only brought home to the minds of the sanitary authorities, considerable further progress in the matter of cremation may be looked for in the future.

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A Scots Housing Practice.

Certain national weaknesses are sometimes so accentuated as to become prejudices or abuses, and among these may certainly be numbered the Scottish recess bed. This is a contrivance generally found in the kitchen of the dwelling, and it is one which even the most untutored in sanitary matters could only regard as an abomination of the worst possible type. Dr. T. Adam, medical officer of health for Stirlingshire, has, in his annual report on the operation of the Housing and Town Planning Act, rendered good service in calling attention to this objectionable feature of Scottish home life. He asserts with ample justification that the tackling of the housing problem means also getting to grips with

most forms of preventable disease, and especially with tuberculosis in its various manifestations, because the defective and insanitary house is undoubtedly one of the chief features in the propagation of that disease. He expresses the hope that the Housing Commission which is conducting inquiries in Scotland may see its way to make some drastic recommendations with regard to one-apartment houses, and proceeds to remark that, so bound up have Scots architects become with the idea of recess bed in kitchens, that even in good class houses in which there is abundance of bedrooms provision is regularly made for them. In numerous kitchens there are usually two of these alcoves, "which defy anything approaching proper ventilation." In a certain case Dr Adam protested to the architects, who replied that the recess would not necessarily be occupied by a bed, and that it was practically unavoidable. Such a defence of a reprehensible practice calls for the use of plain language, and Dr Adam certainly does not exceed the limits of courtesy when he writes "The first part seemed to him a quibble, and the second had a strong resemblance to confessed incompetence." It is to be hoped that the Housing Commission will see its way to accord to Dr Adam the strongest moral support it is capable of exercising in the effort to banish from the homes of Scotland a thing so pernicious as the recess bed, which is a defiant challenge alike to decency and sanitation.

* * *

Health and Environment.

The well-known definition of life as "correspondence with environment" is capable of extended applications which possibly were not in the mind of its great originator. That the kind or character of a man's life is inevitably affected, to a greater or less degree, by his surroundings is a truth which underlies more than one familiar proverb, as, for example, "You cannot touch pitch without being defiled." It is of capital importance, therefore, in the interests of public health, that the conditions of every man's labour and leisure shall be such as to increase the sum total of his life—or vitality—and not to diminish it. It is in this way, and only in this way, that an all-round national efficiency can be attained. Much of the importance of the work of a municipal engineer lies in its direct effect upon the material environment of those whom he serves. The improvement of sanitation, the removal of waste products, the provision of parks and pleasure grounds afford ready examples of this. But perhaps the greatest scope to-day is afforded in the matter of town planning. In the paper which he read at Cheltenham before the Institution of Municipal and County Engineers, and of which some extracts appear elsewhere in this issue, Mr. J. C. Midgley, the deputy town surveyor of Newcastle-on-Tyne, pointed out that the Town Planning Act is the only Public Health Act in which, by the introduction of the word "amenity," it is practically admitted that something more than good sanitation and sound construction are required in town development. Mr. Midgley emphasised the importance of *aspect*, both front and rear, as affecting the health and spirits of the dwellers in a house, and particularly the women, whose work compels them to spend the greater part of each day at home. Another matter of consequence both to residents and passers-by is that elevations should be both pleasing and varied. Matters of this kind, which may at first sight appear to be of comparatively trifling importance, must not be overlooked, as it is only by attention to these details that the full benefits of the legislation of recent years can be reaped.

Warfare and Disease.

The enormous preponderance of the casualties due to disease over those which are directly attributable to the actual operations of the enemy is a matter which attracts public attention when an extended military operations are in progress. As in the case of other matters of preventive medicine, however, there is a tendency on the part of the public to shelve this question, except when it forces itself to the front. This observation does not of course apply to those whose business it is to deal with these questions as experts, but when it is realised that during the South African War there were twenty men who fell as victims to disease for every one killed by the enemy, it will at once be seen that in these days of the creation of huge armies in which any able-bodied man may feel called upon, if not compelled, to serve, the question of military sanitation is one of great and general public importance. It appears from Mr. Kershaw's article on "Losses from Disease During Warfare," which appears in another column, that in the Russo-Japanese war the Japanese Army succeeded in reducing the ratio to about five to two. How was this striking result achieved? The answer is that it was not due to the possession of superior scientific attainments or better apparatus, but rather to the recognition by all ranks, from the general in command to the private soldier, of the requirements of modern sanitary teaching as applied to war, and to the ready obedience to all orders issued to the army on this subject. At first sight Mr. Kershaw's suggestion that future improvement may be gained by more systematic instruction in personal and domestic hygiene in elementary schools may appear to be a little wide of the mark. In our opinion, however, it is very much in point, for we are convinced that in this, as in most other matters, too great value cannot be attached to sound training in the earliest and most impressionable years. The child who is trained to habits of sweetness and cleanliness will not readily lose them, and will inevitably apply them as far as practicable in any circumstances in which he may find himself.

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The Road Question in Calcutta.

While Bombay, after a period of agitation over the treatment of the roads, has, as we gather from the *Times of India*, "settled down to the tarring process," it appears that the tale has been taken up in Calcutta, whose corporation, greatly daring, as we think, have invited an expression of opinion on the subject from various public bodies. The Bengal Chamber of Commerce, one of the authorities contributing to the symposium, are strongly on the side of tar-macadam as superior to water-bound macadam, and they recommend the continued use of tar-macadam. They point out, however, that roads recently treated with tar-macadam are much too soft, and suggest that the corporation should carry out experiments with a view to discovering a material that "will harden within a reasonable time." For roads carrying heavy traffic they advocate wood paving or asphalt. The Calcutta Trades Association and the Bengal National Chamber express substantially the same view, and the latter body think that the damage to roadside plants by percolations from the tar should be the subject of inquiry by experts. More will be heard of the matter, for we learn that the chief engineer of Calcutta has received instructions to draw up a report upon the numerous presentments received, and this will doubtless include a contribution of his own experience and practice. After all it is in the latter that we must look for the solving of a problem such as that which is peculiar to the cities of India.

Housing and Town Planning.

THE PROBLEMS OF NEWCASTLE-ON-TYNE.*

By J. C. MIDGLEY, Deputy Town Surveyor.

The fact that Newcastle is a commercial and industrial centre, that the price of land is excessive, and that even with increased travelling facilities the workman is practically limited to the urban districts where land is dear, renders the housing problem most difficult of solution.

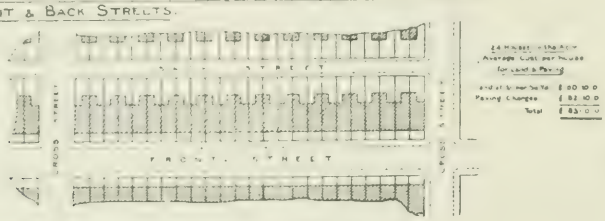
As far as regards the ordinary commercial population, the problem is more or less simple as the travelling facilities are good. The starting time for workmen is generally 6 a.m., which, if they live at any distance from their work, may mean rising at 4.30 a.m. or earlier, and not returning home before perhaps 6.30 p.m. Moreover, in the only direction in which cheap land can be found—viz., towards the north-west—railway facilities are not arranged for the artisans. The demand for house accommodation therefore is greatest in an area close to the river, where land is dear.

The author has made careful inquiries, and finds that the cheapest land on Tyneside appears to be about 4s. per square yard to the builder, and this does not include any street formation charges. This is the minimum price, the price rising from that figure to 10s. 6d. per yard or more, even in the immediate vicinity of the localities in which the labouring class population already live.

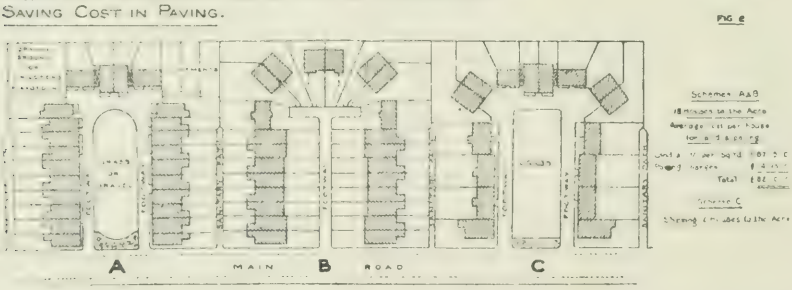
In the east end of Newcastle, on the Walker estate, belonging to the Newcastle Corporation, much of the land is let off at a charge of 4d. per square yard per annum for the portion built on, and 1d. per square yard for the portion not built on. For twelve houses to the acre this works out at 1s. per week for land alone, which, together with interest on paving charges, would be a serious item, even to the artisan with his 37s. per week, much more to the labourer with his 25s. per week. In these circumstances it is obvious that even twelve houses to the acre is too costly, and in the proposed town planning scheme for the eastern district of Newcastle it is not intended generally to suggest anything less than an average of from fourteen to eighteen houses to the acre over the land unit, according to the relative position of the existing houses, which have been built twenty to twenty-four to the acre, and for the most part contain two flats each. A large number of such flats have been built on Tyneside, and it is not intended to debar them altogether; but this class of dwelling is diminishing in favour. As there is still a certain demand for them, it is suggested that, where permitted, taking the two dwellings as one house, the number of houses per acre shall be less by about one-sixth than where the houses are single dwellings.

Even with these conditions the problem will remain of reducing cost in every possible direction. One way, of course, is to cheapen the land. There is no doubt that the price of land on the outskirts of large cities is largely fictitious, as a result of the crowding of houses together in small areas; but these fictitious values cannot continue. As no compensation can be claimed under the Town Planning Act on account of the limitation of the number of houses to the acre, and as no authority would think of allowing anything like the old number of houses per acre, the result will probably be that the landowners of the larger areas will have to lower prices, and that the small landowner will have to follow suit. In the end it may be an advantage to sell twice the quantity of land at a smaller price per square yard, but unfortunately this argument would not appeal to the owner of a small quantity of land.

ARRANGEMENT OF TERRACE HOUSES AS LAID OUT UNDER BYE-LAWS WITH FRONT & BACK STREETS.



SUGGESTED ARRANGEMENT OF HOUSES IN QUADRANGLES SAVING COST IN PAVING.



As there are so many factors in the case, even without the question of betterment, the advisability of pooling the whole of the land under a town planning scheme may be one that is well worthy of consideration, and though hardly coming within the province of the municipal engineer, the consideration of such a scheme may be worth suggesting to any owners concerned. But even under such circumstances it is improbable that the cost of the land in industrial districts will be brought down to a figure that will allow large gardens or open spaces round each individual house.

There is the possibility of a considerable reduction in the street making charges which in the ordinary by-law streets have proved such a drawback in the past. Under the existing by-laws in Newcastle, 40-ft. front streets and 20-ft. back streets are required, and the method of street making has practically made the charges for front streets from 20s. to 25s. per foot-run per site, and those of the back streets from 10s. to 12s. This means on a 16-ft. site a charge of £24 or at 4 per cent 4½d. per week for paving only. There are miles of these grey, dismal streets in Newcastle where money has been absolutely thrown into the ground, although it is true that they preserve a better

*Extracts from paper read at the annual meeting and conference of the Institution of Municipal and County Engineers at Cheltenham.

minimum distance between the houses both back and front than might otherwise be the case.

A great saving in street charges can be made by building the houses in quadrangles, and the author has sketched suggestions for comparison with the old by-law method (Figs. 1 and 2).

The artisan does not always desire a large garden, and some much prefer some other means of recreation, and it might prove a more profitable and satisfactory method to have each individual house with only a small quantity of land and have the extra open space as a playground for the children, a drying ground, or a bowling green. In the Northern towns many workmen are devotees to bowling, and a bowling green at their own house door would be a greater attraction than a garden. Such an arrangement might be even a source of profit, or at least pay interest on the value of the land.

At the meeting at which Mr. Mudgley's paper was read,

Mr. H. GILBERT WHYATT (Great Grimsby) said he had been looking at the Newcastle town planning scheme plan, and it seemed to him that it was about the most practical plan for his purpose that he had seen in the various exhibitions he had attended. At the outset of his paper Mr. Mudgley had spoken of pretty plans with roads having graceful curves. That might suit some towns, but in Grimsby what they wanted were direct roads through estates whose owners were not proposing to put in any roads at all.

Mr. E. Y. HARRISON (Wellingborough) said that in his town 90 per cent. of the houses were occupied by people of the industrial class, and he should say that by far the largest proportion of them were let at rents of 5s. 9d. and under per week. There were quite a number of small areas which were in a very unsatisfactory condition; in fact, a considerable number of houses let at 3s. to 4s. per week had been condemned. The council were loth to move, because it did not seem possible for them to construct houses which could be let for less than 5s. 9d. per week and make them pay. But if the council could only wipe out these areas and provide accommodation for the people at no great expense, under the Town Planning Act, he knew they would be glad to do it.

Mr. W. J. STEELE (Newcastle-on-Tyne) said that the city which he represented, while it owed something to the general idea as a result of the carrying out of the scheme of Richard Grainger, were not among those who believed in compulsory town planning. Grainger's scheme was an example of what could be carried out without compulsion. He tackled the problem in a very practical way. Not only were the highways planned on a bold scale, but the whole of the buildings were kept to a uniform character in every street—and the result was very good. Of course, at the present day even that scheme was too small, but it showed what enterprise could do, and what the majority of owners would do if they had an example before them. The idea that owners generally were opposed to the idea of town planning was, he thought, wrong. As a matter of fact many, when the principle was explained to them, were very helpful. He did not believe they should attempt to coerce the owners; his experience had been that they would help if only they were given a proper lead. One of the great causes of delay in the past had been due to their endeavouring to come to an agreement with the owners before approaching the board; but that formality had now been dispensed with, and that would help them considerably in Newcastle. As regarded roads, that was a work that should be done logically; there was no object in laying a road that led to nowhere, and the question they had to ask themselves was where a road was going to lead to when it reached the boundary of a district. That was one of their difficulties in Newcastle. They had realised it was essential to have one long wide road from the centre of the city, but on getting to the boundary they reached one of the main roads of an adjoining authority. They wanted to know where their road was going to from that point, but the authority had not considered the question. Present-day traffic consisted largely in commercial districts of vehicles carrying 6 and 7 tons of goods, and as a great many of these vehicles made journeys of probably 30 and 40 miles, wide roads were required, not in one, but half a dozen districts, and in planning these wide arterial roads they had to consider that. When they started town planning they attempted to plan roads on the principle of connecting all outside roads with the centre of Newcastle, but, while the county council sympathised with the principle, they failed to co-operate in the matter, and the district councils, while they did not object, would not spend any money. They would like to have some control in that way, but did not think they ought to have too much bother with the owners. They had not the time to make beautiful curved roads, but their point was that in a business centre the whole thing was speed and despatch, what was wanted was to get quickly from one point to another, and that was only possible by making roads in straight lines. That was why in Newcastle they had abandoned the curved road. He did not think it was necessary in any district to limit the number of houses to the acre down to less than twelve, for the reason that if the maximum number for a particular area was twelve, and it was desired to build only four to the acre, the spirit of the Act would be fulfilled.

Mr. THOMAS ADAMS (Local Government Board), dealing with Mr. Steele's concluding observations, said he did not think it sufficient to leave the matter to chance. As to the width of roads, he considered that in many cases a 60-ft. road would be very desirable, but he should like to emphasise the necessity of having good building lines or a good set-back. One could not tell exactly what roads were likely to be required. One might be planning a large town which might not materialise for many years; therefore one ought to have sufficient forecourts to provide for altering the plans. One of the difficulties in the past had been to purchase buildings. The question had been asked whether they ought not to be allowed a deeper building line with four houses to the acre; but the Local Government Board had to decide whether the building line they fixed was reasonable for the purpose of air space. If there was to be a deeper building line it ought to be when there was a larger instead of a smaller number of houses. As to the question of industrial centres and speed of traffic, there, again, was an argument for wide roads. It was a question of congestion or interference with the free running of the vehicle, and, considering the width of road and efficiency of business, they would find a straight road was desirable. Another difficulty was that of fixing the number of houses to the acre in a district between a slum area and one covered with villas, but that could be overcome by graduating the number as they approached the two areas, increasing in one direction and decreasing in the other. His experience had shown him that people from being untidy in their mode of life had altered from the very process of changing their environment, becoming people not unwelcome as neighbours. The cottage as formerly found in their rural areas was not an untenable idea, but they must be gradual and not try to jump from the existing conditions into the ideal at once. Many of these difficulties would have to be met, and for the time they would have to sacrifice much that they might want. As to flats in back streets, personally he was a whole hogger against them. The money spent on them was wasted. The right principle was to plan towns with a view to building up a strong citizenship in our country.

Councillor VINCENT (Newcastle-on-Tyne) said that Mr. Steele had referred to the work of Mr. Grainger in their city, but he had omitted to mention the huge amount of money that great town planner had lost through his enterprise, and the equally large amount his successors had made. They had a good deal of town planning still going on in Newcastle. One scheme which they were trying to carry out was on what was known as the Walker estate. Only a small portion of that work had as yet been completed, but they were getting on as quickly as they could with the work. It would be years, however, before the ideas laid down were by any means complete. The great firm of Armstrong had opened a yard in the neighbourhood, and that had induced the corporation to utilise the estate to its best advantage. As to the question of friction between local authorities, there were not many bodies who had to contend with more of that than they had. They were barred on the south by the river; then they had round about them four local authorities with whom they had had a great deal of negotiation into which an element of jealousy had entered in some instances. Means of transit was a question that was perplexing them considerably; they wished to feel that they could go further than the boundary of their own area.

Mr. L. ROSEVEARE (South Shields) mentioned that 68 per cent of the population of his town was housed in double flats, and asked how they should negotiate with the owners if they did away with these. He

[illegible]

Mr. Murray in replying pointed out [illegible] had been living in the centre of the city in large, [illegible] The [illegible] The problem was really twofold. The centre estates. As to the question of [illegible] there was, of course, no objection to curved roads where necessary—as on hills. The objection to such roads [illegible] of making a nice plan. He thought back streets were very objectionable, but the houses had been kept a [illegible] The objection also to [illegible] them. At the same time, they were not so much in favour as they used to be, the little self-contained houses being more popular. Probably the question would right itself in the course of time, and he hoped they would be a thing of the past.

ROAD-MAKING IN BRIDGE OF ALLAN.

By Harry Blackadder,

Burgh Surveyor and Engineer.

During the past seven years a large amount of work has been carried through in this burgh by way of improving the condition of the various streets and roads. As mentioned in a previous article I wrote, road tar is the other method—blending the stones with sand or road scraping—has been almost entirely abandoned.

Tarred whinstone metal, laid down in accordance with the [illegible] contained in the article published in The Surveyor of January 6, 1911, continues to give excellent results. In that article I mentioned that it was my intention to resurface a street in blast furnace slag grouted with tar. Such a street was treated during the summer of the year 1911, and it [illegible] time as thriving as good a condition [illegible] when it was put down.

In the summer of last year the principal or main thoroughfare was resurfaced with tarred blast furnace slag. The road in question is over a mile in length, and the average width of carriageway 24 ft., or thereabouts. The road is [illegible] known as the Great North Road, being part of the main trunk, and carrying all through traffic for the North and South of Scotland. The through traffic is exceptionally heavy, and I have always thought that in a case of this sort the Road Board ought to give very considerable assistance towards its upkeep.

The slag has stood the winter, and at the time of writing the road is looking very well indeed, and is in good order.

The author has all along been of opinion that it is a mistake in resurfacing roads to make up the finishing coat of too fine material as the latter rapidly gives way during the winter, especially after frost, when horses are often still running with studs. The surface coating should be of not less than 1½-in. material, with the interstices closed with chippings, the whole afterwards being bound with a spraying of tar.

Carefully selected blast furnace slag, when used in conjunction with tar, gives a very satisfactory wearing surface. Where, however, the foundation is in any way doubtful, the depth of tarred slag should never be less than 4 in. after consolidation, and the author usually specifies for the under coat 3½ in. of 2-in. material, and for the upper or surface coat 2 in. of 1½-in. material, which, after rolling, gives a consolidated depth of 4 in.

A Glossary of Road Terms. By H. Percy Boulnois, M.INST.C.E. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 2s.—Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he had made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before.—*Portsmouth Times.*

ROAD CONSTRUCTION METHODS IN NORWICH.

By Alfred E. Collins, M.Inst.C.E.,

City Engineer.

During the past [illegible] the Norwich Corporation has been engaged in [illegible] of the main roads of the city lying between the streets of heavy traffic in the centre of the city and those of less traffic with solidly [illegible] Quarried [illegible] and on a thoroughly consolidated bottom, called by the greatest [illegible] and treated with hot bitumen or hot pitch composition. Much of this solid grouted work was laid between three and four years since by contract, and that done with pitch composition has been quite successful, while much of that done with bitumen has not been so in all cases. The work at that time was done by a firm of specialist contractors, but I consider the unsatisfactory results to be due to their methods, and not to any defect in the bitumen, as other streets done afterward by the same contractors and with similar material have been quite satisfactory. I have had thoroughly good results with Clare's pitch composition, Mexphalte, Plascom, Roadamant, and Macgrout. I am now using the last-mentioned exclusively; it appears to offer as good results as any, and being made at the Norwich gasworks, where arrangements are in progress to deliver it to me hot, I am and shall be able to effect considerable economies as compared with the use of the other materials named.

In some cases the method has been to prepare a thoroughly solid bottom, and to lay thereon about an inch of Roadamant, which is a mixture of bitumen and granite chippings, this mixture being laid hot and floated with trowels in the same manner as ordinary asphalt is laid. The admixture of granite chips makes the cost per yard greatly less than where pure asphalt is used, and from my observation of wear for the year or so this material has been in use it appears to me it will be as durable as asphalt.

Generally speaking, the soil here is such that, if coated with local gravel and thoroughly rolled, the necessary support is given to the wearing surface of the road—that is to say, it is not generally necessary to go to the expense of concrete foundations for our bituminous macadam or asphalted roads. This also applies to granite-setts and woodblock paving in many parts of Norwich.

The corporation has extended bituminous macadam to the narrow streets in the older, poorer parts of the city, not so much having in view its resistance to wear, but because of the sanitary advantages of an impervious and smooth surfaced pavement. As a rule, in these streets the vehicular traffic is very slight, but the streets are largely used as playgrounds by children; hence the importance of the surfaces being such as are easily kept in a thoroughly sanitary condition.

Norwich labours under the disadvantage of having a very large mileage of main roads which radiate from the city like the spokes of a wheel, and a relatively very small rateable value, with the result that we are unable to proceed with the raising of the status of our roads as rapidly as we desire.

The Road Board has given us one grant, and has advanced a loan (free of interest) to be paid off in five years. This is enabling us to proceed somewhat faster than if we were entirely dependent upon the rates, half-year by half-year.

No new streets are now made in Norwich unless the surfaces are paved. This is generally done with tar-macadam, but where the traffic is likely to be heavy it is done with solidly grouted bituminous macadam.

At the time of writing I am engaged in constructing and erecting a much enlarged plant for drying and heating stone by machinery and for mixing it with specially prepared Macgrout. My intention is to roll this down, and grout it solid with similar composition.

The difficulty I have experienced with the grouting system is that a shower of rain hinders the work, and sometimes does damage. My object in coating the stones first and then grouting is to avoid the damage done by rain during the progress of work, and to be at the same time sure that I will get a solid road instead of a road containing many cavities as sometimes happens with tar-macadam.

Whether I use bitumen or pitch composition I mix as much hot, graduated sand with the bitumen or

composition as it will flow into the spaces between the stones. This is done partly to ensure a firm foundation or filling between the stones proper of the road, and partly to encourage bitumen or pitch into position.

We have improved several miles of roads, but have a very large mileage to do before the work is completed in this city.

AUCHTERDERRAN, FIFE, SEWAGE WORKS.

DIFFICULTIES IN A COAL MINING DISTRICT.

The rapid development of coal mining in Fifeshire has brought with it the problem of river pollution, both by industrial processes and by the crowding of population. The works described below, which have been carried out by the Kirkcaldy District Committee of the Fife County Council, deal with the latter aspect only.

The river Ore has in its immediate neighbourhood many populous places, singly or in groups, and one of these groups, including Auchterderran, Bowhill, Cardenden and Jamphlars, was formed into the Auchterderran Special Drainage District.

Owing to the configuration of the ground, there was difficulty in bringing all the sewage to one place by gravitation. Pumping was obviously to be avoided if possible, while it was considered that the cost of management would be much less, and the efficiency much greater, with one work than with several small ones.

A further difficulty, which has had serious results in other parts of the county, was that mining developments might alter the levels. This was met, as far as possible, after consultation with the representatives of the Fife Coal Company, Limited, by placing the works on the part which is likely to sink first, and by laying the sewers with such a general direction that the lower end in each case is likely to go down sooner than the upper end. The purification works are so arranged that in the distributing apparatus there is a considerable margin for adjustment should irregular settlement take place.

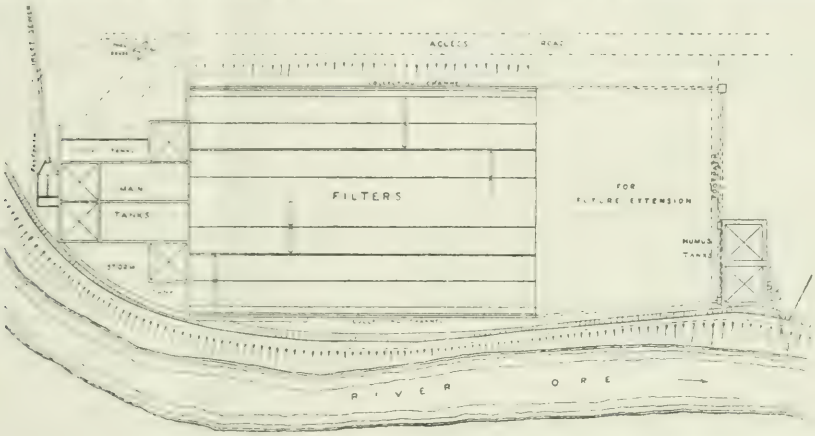
SEWERS.

Ultimately a scheme was adopted which collects the sewage and delivers it at the purification works without pumping. The main sewer is 18 in. in diameter, and follows closely the valley of the Ore, mostly on the south side, but crossing to the north a short distance above the purification works. Further up it crosses the Den Burn, while two large branches come into it from the north side of the Ore. There are thus four river crossings, each by means of a steel tube carried just above the flood level of the river. These crossings were necessary in order to get the straightest and therefore the shortest route for the main sewer, and also to avoid going against the probable direction of the coal workings.

PURIFICATION WORKS.

These are situated on the north side of the Ore, immediately above the junction of the Kirk Burn. They are well seen from the railway about a mile east of Cardenden station. The ground was comparatively flat, and no exceptional amount of earthwork was needed. The works consist of [illegible] chambers, sedimentation tanks, filters, and humus tanks, with the addition of a storm tank to deal with excessive flows. Storm overflows are, however, provided at various parts of the sewers, and these will be so adjusted that the total amount of liquid carried to the works will not exceed six times the dry-weather flow. When this maximum quantity reaches the works, about half will be diverted into the storm tank and treated by sedimentation only; but any quantity up to about three times the dry-weather flow will be passed through the ordinary tanks and filters.

The grit chambers are in duplicate; the sedimentation tanks are in two sets, each consisting of three tanks. One set or both, or parts of both, can be used at any one time. From the deep tanks the sludge is removed from time to time by opening a valve, and thereby allowing the pressure of the sewage itself to act on the sludge and force it out. It is thus delivered by gravitation a few feet only below the water level of the tanks. It can either be delivered into a sludge tank and allowed to drain, or it can be delivered into barrows and taken to the land. It is removed from the tanks without any handling. The method is an adaptation of the well-known "Dortmund" tank, and attains in a simple manner the object which is now regarded as very important—namely, the withdrawal of the solid matters as promptly as possible from the main stream of sewage. The tanks are all constructed of reinforced concrete.



Auchterderran Sewage Works: Plan.

The filters are rectangular in form, and the tank liquor is distributed over them by four travelling distributors of the Fiddian mono-rail type.

The filtering medium is whinstone. It is admitted that this is not quite so effective, bulk for bulk, as a material with a rougher surface, such as clinker would be, but on the other hand it is much more durable. It was considered here of more importance to produce a moderately good effluent by the use of a permanent material than to endeavour to get a very high-class effluent from a material which might cause trouble by disintegration.

The filter floor is of concrete, sloping to both sides from a central ridge. It is covered with semi-circular tiles, on which the filtering medium is laid to an average depth of about 4½ ft. in graded sizes, the largest pieces being next the tiles and the smallest layer on the top.

The filtered liquid passes to the humus tanks, which are another pair of tanks on the Dortmund principle. The liquid, after leaving the humus tanks, is discharged into the stream.

The design and supervision of the works—which were formally opened on July 29th—were in the hands of Messrs. Gilbert Thomson & Ferguson, civil engineers, Glasgow, and the contractors were Messrs. David Adamson & Co., Cowdenbeath. Mr. James Williamson acted as clerk of works. The total cost, including sewers and purification works, has been between £9,000 and £10,000.

Modern Methods of Road Construction and Maintenance.

WHAT MUNICIPAL ENGINEERS ARE DOING.

(Conclusion.)

In response to a request made a short time ago we have been favoured with a large number of communications from readers embodying the results of their experience with the methods of road construction which it has been necessary in recent years to introduce into their districts in consequence of changes in the character of the traffic. Instalments of these appeared in our issues of the 4th and 11th inst.; a third and concluding one is given herewith.

BELPER (RURAL).

Mr. Robert C. Gordon, Engineer and Surveyor.

This rural district, with its 162 miles of highways, many miles of which are semi-urban, has during the past fifteen years adopted a more liberal use of granite for road maintenance, in place of slag and limestone. Owing chiefly to the heavy motor traffic we have also experimented with tar-spraying and tar-grouting. The latter, although the initial expense is heavy, undoubtedly gives most satisfactory results.

BIRR (URBAN).

Mr. Henry Browne, Assoc.M.Inst.C.E., Town Surveyor.

The Birr Urban District Council, seeing the necessity for improved methods in repairing the roads in the district, last year purchased a 12-ton Aveling & Porter steam roller. We intend to steam-roll all the roads in the urban district. The council are satisfied that the system will tend to economy. I may add that I believe I am right in saying that the Birr Urban District is the smallest in Ireland who have purchased their own roller.

COLNE.

Mr. T. H. Hartley, Borough Surveyor.

In consequence of the great change in the character of the traffic of this district we have been compelled to go in for a large reconstruction scheme for our main roads, converting granite-macadam on boulder underbed to granite-sett paving on cement-concrete, and also to proceed as funds will allow with the construction of new foundations to other roads. Water-bound roads are being replaced as far as possible by tar roads in one form or another. This work, of course, entails heavy expense. No doubt after a few years the benefit of this reconstruction will make itself felt by an easing off of the cost to some extent; at least it is to be sincerely hoped for.

GRAYS.

Mr. Arthur C. James, Assoc.M.Inst.C.E., Engineer and Surveyor.

The Grays urban district lies on the main road from London to Southend and to Tilbury Docks, and the principal thoroughfares are traversed by much, and constantly increasing, heavy commercial motor traffic.

In the course of widenings and improvements carried out some years ago the opportunity was taken to strengthen foundations. The effect of this policy, and of the excellent results obtained in the treatment of road surfaces with tar and similar materials during the past ten years, has been that the new traffic has not caused so much damage as in other districts. There has not been any increase in the cost of maintenance when the expenditure upon street watering is taken into consideration.

The average cost for the three years ending 1905 was about 1½ per cent more than for the three years ending 1913, though the mileage had increased 7½ per cent in the meantime.

Up to the present coarse sand from local pits has chiefly been used for covering the tar-treated surfaces, but experience in the use of granite chippings for this purpose on small sections of road has shown this material to be so effective as to be worth the extra expense involved, and it has been decided to use it on all the principal lines of traffic this year.

Last year Fluxphalte was used instead of tar in the centre of the town, and this year its use will be considerably extended.

In new methods of surface reconstruction several experiments have been made with different materials, but so far it cannot be claimed that the results have been so completely satisfactory as to warrant their universal adoption, though, under certain conditions, they show a marked advance on water-bound macadam.

These experiments have included the use of tar and pitch (both grouted by hand and sprayed by machine on the loose macadam), several bituminous binders, hand-grouted in situ, and stone coated before being placed in position on the road.

The principal defects noted have been waviness in the surface, arising at an early stage after completion, and a tendency to crack and admit water to the sub-crust—the latter fault detroying the cohesive effect of the binder.

In repairing roads subjected to heavy, fast motor traffic, the extent to which the macadam is crushed is most noticeable, the result doubtless of the blows given to the road by the vehicles. A bituminous-bound road subject to this treatment generally consists of a number of small stones coated with bitumen on one side only, instead of each stone being thoroughly coated and bound to its neighbours.

My observations have led me to the opinion that the use of 2-in. or 1½-in. macadam must give way to the use of a much smaller aggregate in the surface of bituminous-bound roads. The sizes and proportions of this small aggregate will be a matter for experiment, the ideal at which to aim being a smooth, even surface, similar to that of asphalt, so far as this is practicable having regard to cost.

A strong foundation is, of course, essential.

KESTEVEN.

Mr. W. B. Pueser, Assoc.M.Inst.C.E., County Surveyor.

So many complaints have been received as to tarred macadam in this county that we have discontinued the use of it on main roads, except for small repairs and patching during the summer months. Many of our markets are held early in the day, and especially during the winter months, owing chiefly to climatic conditions, tarred macadam roads are constantly very slippery in the early morning.

In lieu of tarred macadam we have adopted improved construction of water-bound roads. Many lengths have been put down in Ferromac, Vianex, with limestone graved as a binder, and very good results have been obtained with each. It is found that if a properly constructed water-bound road be well made and thoroughly consolidated, and afterwards surface dressed with Tarvia, it resists motor traffic, wears well, reduces the dust nuisance, and generally gives very excellent results at a very small cost. In many cases where a road has been surface dressed for two years in succession it is found unnecessary to treat it the third year.

MALVERN.

Mr. Wm. Osborne Thorp, Surveyor.

During the past few years, owing to the large amount of motor traffic passing through this district, it has been necessary considerably to strengthen the road crusts, and long lengths of tar-macadam, pitch-grouted macadam, Ferromac, Roemac, and Glutrin bound roads have been laid down with good results; while over 100,000 sq. yds. of water-bound macadam roads are tar-sprayed during the summer.

Owing to the enormous increase of traction traffic in parts of the district, 2½ miles of road are being entirely reconstructed to carry the heavy burden imposed upon them, the cost of this approaching £9,000. This work entails 13,350 cub. yds. of excavation, over 8,000 cub. yds. of rubble foundation, hand packed.

and 5,500 cub. yds. of 2½-in. granite, bound with Rocmac, covering an area of over 32,000 sq. yds.

The council have erected a large shed for tarmacadam work at their quarries on the Malvern Hills, but are using Clee Hill stone for main road work where subject to heavy traffic, as the local stone, though obtained very cheaply, will not bear the weights now put upon the roads satisfactorily.

NOTTINGHAMSHIRE.

Mr. E. Purnell Hooley, M.Inst.C.E., County Surveyor.

I am afraid my opinion again stated must be an "oft-told tale repeated." My council, owing to the change of traffic, commenced to use Tarmac twelve years ago, and have gradually increased its use until 70 miles of the main trunk road roads, as well as 23 miles of the same roads in urban districts, are now reconstructed with a centring of this material, in the manner set out in a little book of "Instructions to Workmen."

The Road Board have approved of a scheme, and are contributing to it by way of grant and loan, for a continuation of this Tarmac reconstruction work of a further 90 miles of rural and 24 miles of urban trunk roads, which will complete the work on the whole of the present most heavily trafficked roads of Notts.

It has been proved repeatedly that water consolidated materials, costing 10s. 7d. per ton, two stones thick, or 4½ in., laid length to length with Tarmac, costing 13s. 8d. per ton, last six months as against five years if constructed with about ¾ in. less thickness of Tarmac.

I do not think it is necessary for me to say more.

SUTTON, SURREY.

Mr. Wm. Hedley Grieves, Surveyor.

During the last three years the Sutton Council has spent several thousand pounds in making their main roads suitable for the changes in the character of its heavy traffic. Various kinds of material, bituminous and otherwise, have been tried.

It is highly essential in a residential district like Sutton, and within such easy reach of London, that its roads should, as far as possible, be thoroughly up to date.

I propose to give you a short statement of what we have done, commencing with the Mexphalte bituminous road we put down about twenty months ago. The length of road is about ½ mile, with an area of nearly 6,000 super. yds. The material is laid in two coats, of a total thickness of 3 in., composed of Quenast granite gauged from 1½ in. down to ½ in., excluding dust. Twenty to 25 per cent of sharp sand is added, and the whole dried and heated to a temperature of 300 deg. Fahr. After being mixed on the site with the mechanical mixer it is spread on the road at a temperature of 260 deg. Fahr., and rolled to a thickness of 2½ in. The wearing coat, consisting of ½-in. to ¾-in. granite chippings, is then laid and rolled to ½ in. in thickness. This material was laid on the main road from London to Brighton. A great portion of the road was without kerb, simply having a grass border, and without going to the expense of putting in kerb for the whole length we adopted the method of using as an abutment 4-in. by 3-in. creosoted deals, secured by iron-dogs to stakes every 10 ft. Up to the present this method has answered its purpose admirably.

We have laid also three sections of Quarrite, supplied and laid by the Northern Quarries Company, which has been down over two years. The material consists of Leicester granite mixed with special bitumen, and laid in two coats of a total thickness of 3 in., and is on the main road from Sutton to Epsom. This still presents a very good surface.

Nearly three years ago an area of 2,500 super. yds. of tarred slag macadam, supplied and laid by Constable, Hart & Co., was put down in two coats of a total thickness of 3 in., and is to-day in very good condition. This is a section of the main road first referred to, and has kerb and channel on each side.

In the business part of the main street of the town where in some places the road is very narrow, the council have laid three sections of wood-block paving, supplied and laid by the Improved Wood Pavement Company. The first section was laid in August, 1911, the second in October, 1912, and the third in November, 1912. The blocks were 7-in. by 4-in. by 3-in. deals, laid on a 7-in. bed of cement-concrete. The total area of this paving is over 5,000 super. yds.

In June, 1912, we put down a length of Roadamant (supplied and laid by the Roadamant Company, Limited) in the main street. It was laid 1 in. thick upon a water-bound macadam foundation, and consists of natural asphalt and granite chippings, heated and laid direct on the road.

Four fairly long lengths of Rocmac have been put down, the first early in 1911. This material consists of Guernsey granite, or Penlee basalt, 3 in. thick, and mixed with Rocmac solution and limestone dust. The makers claim that this material can be laid in any weather, including frost, and that it is less muddy and dusty than an ordinary macadam road, and also holds together better. There is a remarkable absence of mud on these roads, and I have had two of the sections tar-sprayed. There is no doubt that this is far in advance of ordinary water-bound macadam, which on many roads such as these with the heavy traffic they have to bear, is useless.

We have had grants from the Road Board and county council in respect to the whole of the above roads, and in the case of the bituminous roads we have maintenance guarantees for three and five years.

There is also a length of road laid with Tarvia. This has been down five or six years, and consists of a 2-in. Guernsey granite, and a ¾-in. carpet of chippings and Tarvia, finally top-dressed with the same material. This has been tar-sprayed each year.

Our side roads consist chiefly of flints obtained in the district. These roads we make a point of tar-spraying each year, with splendid results. A great saving is effected thereby, not only in watering, but in the wear and tear.

It is difficult to say which is the best form of construction, as one method will answer better in one position than another, but there is no doubt that the bituminous roads such as are now made are the roads of the future, where the cost of wood paving would prevent its general use. Otherwise, undoubtedly this (wood paving) is the road for heavy traffic.

If a carpet on a water-bound road can be laid so as to prevent water obtaining access between the foundations of the road and the carpet, owing to its being constructed cheaper, is a very effective road, and by this method the vibration caused by heavy traffic is reduced to a minimum.

A cheaper method, and probably an effective one, might be made by putting in a foundation with slag tar-macadam, and surfaced with a bituminous material.

On a hilly road where a bituminous surface might be considered unsafe the Rocmac road is a very successful one.

STRATTON (RURAL).

Mr. J. P. Baker, Surveyor.

My experience after thirty years' trial is that, in the first place, roads should not be less than 18 ft. wide. A great many roads require new ballasting, and the quarters should be strengthened, then laid with a good coat of broken stones, well consolidated, turned, and the crown, and the road should be made only round enough to let the water run off, seeing that the motor traffic is on the increase every year.

TRALEE (URBAN).

Mr. Oswald G. Tough, Borough Surveyor.

None of the streets and roads in my district have been constructed with a view to withstand heavy modern traffic, and all are entirely deficient of foundations. I may state that my district is, for its size, &c., the most heavily trafficked town in Ireland. Owing to the increased volume and density of the traffic, unfavourable weather conditions (the annual mean rainfall being 56 to 60 in.), and inferior stone locally available—the predominant stone being carboniferous limestone of the upper and lower series, small quantities of inferior millstone grits and flagstone being also available—I have found it impossible to maintain and keep the streets and roads in an efficient condition. The wear and attrition is very intensive, being on an average ¾ in. to ⅞ in. per year, and in some of the heavily trafficked routes 1½ in. to 2 in.

I have therefore recommended my council to adopt entire reconstruction year by year—that is, to construct adequate foundations and use bituminous-bound sub-crust and wearing crust, the wearing crust to be of hard primary or igneous rock.

With this end in view, I have recommended a continuous tarred stone plant to be installed at the council's gasworks (1½ ton per hour capacity), a batch

[illegible] regard to weather conditions, machine mixing, &c., [illegible]

I [illegible] oligarchy the Road Board, but up to the time of writing without result, as it is financially impossible, owing to the insufficient amount allocated and available yearly for roads, &c., to effect any permanent improvement.

I have carpeted with crude tar some of the roads and streets, but the wear is not commensurate with the cost and trouble, for after about five months the [illegible] traffic and unfavourable weather conditions. Tar-grouting is, in my opinion, cheaper and better. I reconstructed a suburban road in September, 1912, laying a 4-in. to 6-in. coating of limestone-macadam, and it is to-day the best surfaced road in my district, costing practically nothing for scavenging, and making at least 75 per cent less mud, and drying up quickly. In my opinion pitch-bound macadam, laid by intelligent workmen and under careful supervision, the aggregates being of hard rock, is the most economical road surface construction, from every point of view, for modern traffic conditions.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.
—Massinger: "The Fatal Dowry," Act ii., 2

THE SUPPLY OF TIMBER.

To the Editor of The Surveyor.

Sir,—Architects and surveyors will be very pleased to know that the Swedish Foreign Office informed the Swedish shipowners on the 21st ultimo that, according to advices now received from the Swedish Minister in Berlin, Germany had been pleased to declare deals, battens, boards, staves and packing-case boards to be non-contraband of war.

This attitude of Germany is quite understandable, because she is extremely desirous of keeping friendly with Sweden. The result has been that many new charters have been fixed up, and shipbrokers are again trying to obtain offers. Owners are willing to risk their boats in the Baltic, the risk, of course, being from floating mines. Seven or eight boats during last week have been chartered, and altogether trade is making great efforts to get going again.

I ought to have said that the timber must be carried in neutral bottoms (*i.e.*, in neutral ships), but there is no difficulty in that.

It is still impossible to take timber from Finland, because she is Russian, so that, as some of our best joiners' deals come from Finland, the better class timbers will still be high in price, especially as there is difficulty in loading from the White Sea, on account of the shortage of labour, the conscripts having been called into active service.

At the commencement of the war Russia prohibited the exportation of timber, but she removed this prohibition very soon after it was made. The difficulty is now with the loading.

A friend of mine sent a boat out at the commencement of the war, but it was returned empty because of the prohibition. He had £12,000 worth of Archangel deals and boards on order, which would have been very profitable to him during the coming winter, but he has told me that he had since cancelled the order because of the difficulties of loading. If it could not be loaded before the White Sea had frozen (and the White Sea ports close earlier than any other timber exporting ports), he was afraid they might take fire before they could be loaded per "first open water" in the spring. There are very frequent fires in Archangel on account of the tremendous quantities of timber stocked there, and the difficulty would be for him to prove that it was not his timber that got on fire. It is a very difficult thing to prove after a fire that it is or is not your timber that has been burnt, because there are thousands of other stocks of exactly the same size all piled together.

It seems to me that the position is that we shall be able to take no Finnish and very little Archangel timber, while if timber goes very much higher during the war American spruce and cheap pitch pine will have to take the place of deal. The bright gleam of sunshine is the exportation of Swedish timber.

Since writing the above I have received information from a very reliable source [illegible] that England has shipped about two-thirds of her normal output, so that the total reduction on shipments from Finnish and Swedish ports will not be a very important matter, in view of the fact that the consumption on this side during the war will also be very much less than usual.—Yours, &c.,

J. H. Kerner-Greenwood

King's Lynn.
September 12, 1914.

THE ROAD BOARD AND ULSTER.

To the Editor of The Surveyor.

Sir,—I enclose a copy of a letter which I have sent Mr. Maybury in reply to the criticism of my recent report in The Surveyor [August 21st last]. Yours, &c.,

John W. Leebody.

Tyrone County Council,
County Surveyor's Office,
Dungannon.
September 10, 1914.

[COPY OF LETTER REFERRED TO.]

Dear Sir,—Yours of 8th inst. to hand. I feel not a little honoured in having secured an official correction of what I know to be the feeling of many Irish county surveyors in regard to the most approachable side of the Road Board. My paper, though published now, was written last spring. The latest list of grants which I had then seen—viz., No. II.—contained only one grant to an Ulster county, and the total grants to eight counties to that date only amounted to £28,705. It is gratifying to know that in the last twelve months grants amounting to £34,295 have been made to the nine counties, and I am more than sorry that so little of it has come to Tyrone.

Would it be possible for you to publicly state—

(1) How much of this £63,000 has gone to drainage work?

(2) What total sum the county councils have agreed to provide as against this grant?

(3) What sum has been provided by the county councils of Antrim and Armagh against the £7,000 odd allocated to tar work.

I know I personally was led to believe, in conversation with members of the Advisory Committee, that applications for drainage work, *pure and simple*, had no chance of being considered, except in conjunction with resurfacing or reshaping work.

I can assure you that my references to your board are not made, or intended to be taken, in any unfriendly spirit, and the publication of your letter, with the additional information now asked for, will be welcomed by every Irish county surveyor.—Yours faithfully,

John W. Leebody.

H. P. Maybury, Esq.,
Manager and Engineer,
The Road Board.

VACANCIES ON STAFF.

To the Editor of The Surveyor.

Sir,—Owing to the volunteering by many assistants for the war, I would appeal to all chief public officials to fill any vacancies in their departments by temporary appointments only.

The municipal engineering department of almost every local authority is just now, no doubt, pretty busy owing to the development and preparation of schemes to find work for those unfortunately adversely affected by the war, and this, in addition to the shortage of staff due to volunteering, creates certain difficulties; but the patriotism of those assistants who have offered their services to their country at this crisis ought not to be a stumbling-block to their advancement on their return.—Yours, &c.,

Reginald Brown.

Town Hall, Southall.
September 14, 1914.

SURVEYORS AND THE ARMY.

To the Editor of The Surveyor.

Sir,—Many surveyors, like myself, doubtless feel that their engineering training should be of some assistance to the Government in this time of national service, and our thoughts turn to the Royal Engineers as the branch of His Majesty's Forces where we ought to be able to use our knowledge to the best advantage. There appears to be a scarcity of officers. I would

[illegible] up a [illegible] in the [illegible] of the [illegible] tions, &c., necessary, and feel that a little general in[illegible] of service to [illegible] Years, &c.,

ENGINEER.

September 15, 1914

LOSSES FROM DISEASE DURING WARFARE.

By G. BERTRAM KERSHAW, M.A.M.S.C.I.

It may be of interest at the present time to [illegible] some statistics concerning the effects of sanitation and hygiene upon troops in time of warfare, with a view to gaining a rough idea of the relative numbers of deaths caused by disease and wounds respectively.

It may be questioned whether the man in the street realises when he sees the total death roll at the conclusion of a war how largely deaths from disease outnumber those caused by wounds received in battle. During the Boer War in South Africa (1899-1902) the British Army lost 2,000 men from disease, as against 100 killed by the enemy—*i.e.*, a ratio of 20 to 1. In the Russo-Japanese War we find that the Japanese lost only 250 men from disease, as against 100 killed by the enemy; a ratio of 2·5 to 1.

One is naturally led to ask how was such a low mortality rate achieved?

Turning to Major Barnett's excellent handbook on "Military Sanitation for Regimental Officers" (Forster, Groom & Co., London), we find, concerning the Japanese Army, "that the comparative freedom of sickness would never have been obtained by the work of their medical department alone, however excellent, but was due to the recognition by all ranks, from the general in command to the private soldier, of the requirements of modern sanitary teaching as applied to war, and to the ready obedience to all orders issued to the army on this subject. Their admission rate to hospital for disease in comparison to wounds was, in the war with Russia as 2·5 to 1, whereas in their war with China it was as 56 to 1."

These figures make one wonder whether it would not be worth while to devote a little time to the teaching of sanitation in elementary schools throughout the country.

Strangely enough, elementary sanitation seems to be untaught in English schools, and the subject seems to be quite beneath the notice of the teachers, as being something quite unmentionable, not "genteel," while the words water-closet are mentioned with bated breath. Presumably though, intelligent teachers could be provided who are not afraid of straightforward speaking.

Possibly, if a little more attention were paid to instilling a few simple rules of sanitation and hygiene among school children, even at the expense of subjects which, in nine cases out of ten, the pupils will never be called upon to make use of, the nation would benefit in the long run.

Unfortunately, if a short "official" course were introduced to the school syllabus, it would, in all probability include such subjects as proto-biology, bacteriology, examination of drinking waters for *B. Typhosus*, &c., leaving untouched such questions as "How to dispose of your own waste products in a satisfactory manner, without nuisance to others or yourself."

To give a few more statistics from Major Barnett's book: 347 men per 1,000 died from disease in the Walcheren expedition; in Madagascar, in 1894, the French lost one-third of their men from the same cause; during the Boer War 450,000 were treated for disease, and only 22,000 for wounds, injuries and accidents combined, a ratio of over 20 to 1.

It is gratifying to learn that the benefits resulting from a knowledge of sanitation are recognised by the army authorities, and a school of army sanitation exists at Aldershot, while pamphlets on health memoranda are issued to each recruit on joining. If, however, children were taught when quite young, and when the memory is retentive and the mind impressionable, the importance of simple sanitation and hygiene, they would never forget them, and should they in after years be called upon for military service they would at all events be in possession of the elements of sanitation as a basis upon which to build further more advanced knowledge, while as civilians the early training received would be equally serviceable.

THINGS ONE WOULD LIKE TO KNOW.

(By [illegible])

Is not Mr. G. Bertram Hartfree, the surveyor of Alton, Hants, to be congratulated on the article on "The Municipal Engineer and the King's Forces," which he has contributed to this month's *Journal* of the Institution of Municipal and County Engineers? Is it not evident that Mr. Hartfree has a very considerable knowledge of military hygiene in all its practical branches—knowledge which his article should be helpful in disseminating among his brother surveyors? Is it not an article that might well have appeared in one of the "popular" magazines in order that it could be more widely read?

* * *

Is it not gratifying to find from Mr. Hadfield's statement in the last issue of THE SURVEYOR that 150 employees of the highways department of the Sheffield Corporation have joined the Army, and that others are joining? Who was it who said "One volunteer is worth two pressed men"? And is it not very satisfactory to think that the whole of the British Forces are composed of volunteers? Should not this fact be a strong inducement for all able-bodied men in this country to stand side by side with the gallant men who have already offered their services?

Should not everyone who has a penny in his pocket invest it in the purchase of Conan Doyle's splendid pamphlet "To Arms"? And when they have read it, should they not do everything in their power to assist in crushing the German tyrant who, in *his* call to arms only a few years ago, said to his soldiers: "When you come into contact with the enemy strike him down! Quarter is not to be given; prisoners are not to be made"?

* * *

Can it be a fact that there are still ignorant people in this country who employ the excuse for not fighting for their country that their lot under German rule would be not worse or perhaps better than it is under "party" government? And if this is really what they believe, how is this impression to be removed? Would not a study of the above-mentioned pamphlet help to remove this impression if they could be induced to read it?

* * *

In view of the question of unemployment and consequent distress which is at the present moment exercising our minds and pockets, is it not rather surprising to find the following statement in the last annual report recently issued by Mr. Gettings, the county surveyor of Warwickshire?—"Considerable trouble has been experienced in obtaining manual labour, and for certain classes of work we have frequently had to import men in order to get the work carried out satisfactorily." This statement, of course, refers to last year; but as such work cannot be materially affected by the war, does it not show that there is still a considerable amount of employment available for those who are able and willing to work?

* * *

Who was it who said "The pen is mightier than the sword"? And what would he say if he were alive now? Do not those who are carrying on a warfare against German trade argue that "the 'pound' is mightier than the sword"? Is it not evident that both these statements have a substratum of truth *at the right time*; but would not Lord Kitchener say, "The *man* behind the sword is mightier than these"? Is it not evident that the time has come for soldiers, soldiers, soldiers to bring this war to an end?

* * *

Was not this last question fully authorised by the speeches made at the great meeting at the London Opera House last Friday, when Mr. Winston Churchill, Mr. F. E. Smith, and Mr. Will Crookes, with one accord, pointed out that the only way to bring this terrible war to a conclusion was by pouring more and more troops from this country and from our Colonies and elsewhere into France in order to crush German militarcy?

* * *

Is it not wonderful how successful the German Emperor has been in cementing the friendship between Great Britain and her oversea Dominions? And has not his Majesty actually done more in this direction than our politicians or statesmen, with their best efforts, have hitherto been able to accomplish? Has he had time yet to thank the Almighty for having been the instrument through which this glorious work has been achieved?

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:

417. Sewer Construction. A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the continuation of the line of levels from the surface. (Xing.)

418. Iron Curved Roof. Show details of an iron curved roof of 40-ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G. F., *Buckfastleigh.*)

420. Flow of Water. Assuming that the lower tank B in the accompanying diagram is full of water, and also the 9-in. pipe up to the level of 3·65, what time would it take to empty tank A if the outlet was open full bore? (A. S., *Beverley.*)

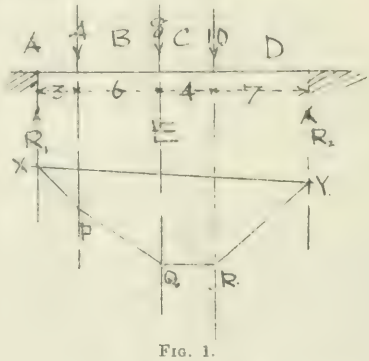
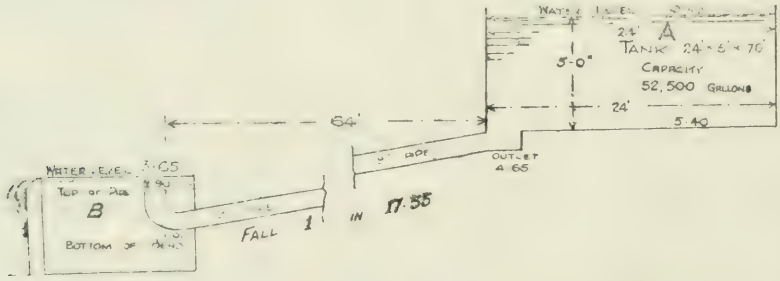


FIG. 1.



422. Building Construction.—The earth in front of a semi-basement to a house has to be supported for a depth of 6 ft. Give a section of a suitable retaining wall, and prove its stability by a graphic diagram.

423. Sewer Construction.—Show by sketches (plan and section) the junction of a 3-ft. and a 5-ft. brick barrel sewer.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

421. Reactions of Beams.—Show how to find graphically or otherwise the pressures on the two supports of a horizontal beam which is loaded at any given points.

This can be done by calculation as follows:

Let Fig. 1 represent the beam on two supports, and loaded with 4, 8 and 10 tons at intervals as shown. There will be certain reactions R_1 and R_2 which we are required to find.

Take moments about R_1.

$$R_2 \times 20 = 4 \times 3 + 8 \times 9 + 10 \times 13 = 12 + 72 + 130$$

$$R_2 = \frac{214}{20} = 10{\cdot}7 \text{ tons}$$

Take moments about R_2.

$$R_1 \times 20 = 4 \times 17 + 8 \times 11 + 10 \times 7 = 68 + 88 + 70$$

$$R_1 = \frac{226}{20} = 11{\cdot}3 \text{ tons}$$

It will be noticed that $R_1 + R_2 = 10{\cdot}7 + 11{\cdot}3 = 22 =$ total load.

This result can be checked graphically by means of the funicular polygon as follows:—

In Fig. 1 letter the spaces between the forces A, BC, &c., in a clockwise direction. Draw a vertical line, and mark off *ab*, *bc*, &c., representing to some scale the magnitude and direction of the forces which come between A and B, and B and C, &c., in Fig. 1.

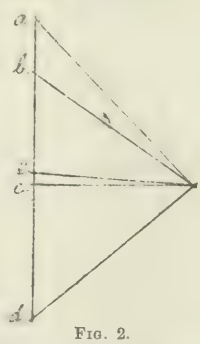


FIG. 2.

Choose a point O at some convenient distance to the right of the vertical line, join *a*, *b*, *c*, *e*, &c., to O. Produce the line of action of the forces in Fig. 1. In the space A draw XP parallel to *a*O in Fig. 2. In the space B draw PQ parallel to *b*O in Fig. 2, and so on till we reach the point Y. Now join XY (Fig. 1), and in Fig. 2 draw O parallel to XY.

de and *ba* represent to scale R_2 and R_1 respectively, and on measuring are found to be 10·7 and 11·3 tons, as we found by calculation. (N. S. J., *Darlington.*)

NOTES.

(Continued from last week.)

A further example illustrating the graphical method of solution of simultaneous equations is that involving

imaginary roots, and is well exemplified from the following. This example is of further interest in that it illustrates the plotting of a rectangular hyperbola and of a parabola.

Suppose the two equations are

$$(\ldots) \quad (\ldots) = 0 \quad \ldots \quad (i.)$$

$$\frac{a^3}{\ldots} = 0 \quad \ldots \quad (ii.)$$

and we wish to find their common root or roots. Proceeding in precisely the same manner as in the other case, and exercising judgment in assigning suitable values to x, we obtain the following tabulated data:

Let $(x) = +a(\ldots)$, and $\frac{a^3}{\ldots}$

$x =$	$-2a$	$-\frac{3a}{2}$	$-a$	$-\frac{a}{2}$	0	$+a$	$+a$	$+\frac{3a}{2}$	$+2a$	$+3a$	$+4a$	$+\frac{5a}{4}$
$y=(\ldots)(\ldots+a)$	$+2a^2$	$+\frac{3a^2}{4}$	0	$-\frac{a^2}{4}$	0	$+\frac{3a^2}{4}$	$+2a^2$	$+\frac{15a^2}{4}$	$+6a^2$	$+12a^2$	$+20a$	
$y=\frac{a^3}{\ldots}$	$-\frac{a^2}{3}$		$-\frac{a^2}{2}$	$-\frac{2a^2}{3}$	$-a^2$	$-2a^2$	Inty.	$+2a^2$	$+a^2$	$+\frac{a^2}{2}$	$+\frac{a^2}{3}$	$+4a^2$

Plotting these results, graphs of the forms shown in Fig. 2 are obtained. It will be seen from inspection that they only intersect at one point, marked D. But equation (i.) is a quadratic expression, and equation

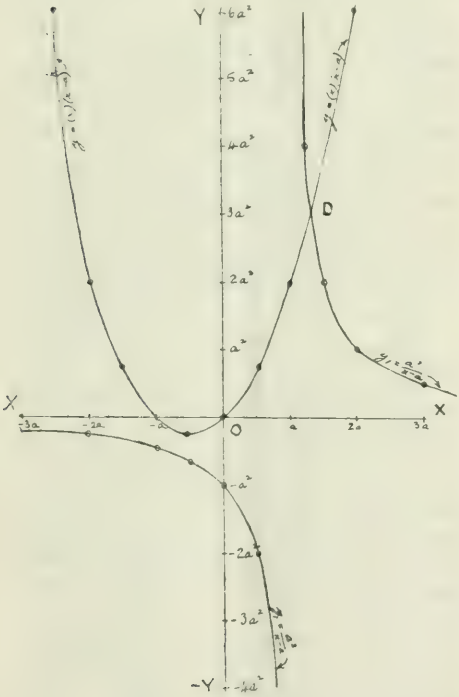


FIG. 2.

(ii.) is a cubic expression; hence we should expect three roots in the answer. But the graph clearly indicates that there is only one common value; hence the other two satisfying roots must be imaginary, i.e., they are the roots of negative quantities. In this connection it is interesting to note that imaginary roots always go in pairs, as, for instance, in the case in point.

Reading off the value from the graph, it is clear that the real root satisfying both equations is obtained from the value of x at D, and at this point $x = 1{\cdot}34a$, and this is the required solution.

This may be proved arithmetically as follows:—

The common root is found from the roots of the equation

$$(\ldots)(\ldots+a) = \frac{a^3}{\ldots}$$

Transposing this, we get that

$$\ldots = \frac{a^3}{\ldots - a}$$

$$\text{i.e., } \ldots = \ldots - a^2 = \ldots - a^2$$

$$\text{i.e., } x^3 - ax^2 - a^3 = 0$$

which is a cubic equation in x, the only real root of which is $x = 1{\cdot}34a$, for, on substitution of this value for x, the left-hand side reduces to zero.

Plotting these results, graphs of the forms shown in Fig. 2 are obtained. It will be seen from inspection that they only intersect at one point, marked D. But equation (i.) is a quadratic expression, and equation (ii.) is a cubic expression; hence we should expect three roots in the answer. But the graph clearly indicates that there is only one common value; hence the other two satisfying roots must be imaginary, i.e., they are the roots of negative quantities. In this connection it is interesting to note that imaginary roots always go in pairs, as, for instance, in the case in point.

Reading off the value from the graph, it is clear that the real root satisfying both equations is obtained from the value of x at D, and at this point $x = 1{\cdot}34a$, and this is the required solution.

This may be proved arithmetically as follows:—

To ascertain the form of a graph from its function, the following principles should be borne in mind:—

Any expression of the form $ax + by = c$ is a straight line, and hence only two points need be plotted.

An expression of the form $ax^2 + by^2$, but no other terms of the second or higher degree, and in which a and b have the same sign but are unequal, represents an ellipse with its greatest and least axes parallel to the axes of co-ordinates.

An equation containing x^2+y^2 but no other terms of the second or higher degree represents a circle if the scales of representation along both axes are the same.

The equation for a parabola having its axis parallel to the ordinate through the origin and at a distance c from it, is of the form

$$(\ldots + c)^2 = 4a(y + b)$$

Now the equation of a rectangular hyperbola is of the form $ax^2+bxy+cy^2+dx+ey+f=0$, provided that $a+c=0$, and that it does not break up into factors.

Thus, $xy = k$, $x^2 - y^2 = a^2$, $6x^2+7xy-6y^2-2x-2y+100 = 0$, are all rectangular hyperbolas.

A few examples in which the above curves are found in actual practice are appended.

(1) Straight Line.—The stress-strain curve of a material under tensional or compressional test, up to the elastic limit.

(2) Ellipse.—In considering the stress on any interface of an indefinitely small cube on whose opposite faces are pure normal stresses acting in opposite directions; the stress over this face is found to vary at different points, and if the magnitude of the stress at many points be plotted an ellipse will be the curve formed by joining up the extremities of the ordinates. This is known as the ellipse of stress.

(3) Parabola.—We have many illustrations of this in the bending moment diagrams of beams supported at their ends, and the load is either a distributed one or a travelling load.

(4) Hyperbola.—The most familiar example of this is the application of Boyle's Law, which states that at constant temperature any change in the pressure of the gas produces a corresponding proportional change in its volume, and *vice versâ*—i.e., the product pressure by volume is constant. If a gas be experimented with, it will be found that this is so, and on plotting the result a rectangular hyperbola results.

In general, the graphical method of solution of simultaneous equations is always applicable, whereas their solution algebraically often presents very great if not insuperable difficulties. (T. W. P., *Bexhill-on-Sea.*)

Metropolitan Water Board Bills.—The Metropolitan Water Board's offer of £1,000,000 of money bills was subscribed for more than five times over at the Bank of England on Monday, the 14th instant, and the board had the satisfaction of raising the money at an average rate of £3 3s. 1d.

PRO PATRIA.

[SECOND LIST.]

In our issue of August 28th we commenced the compilation of a "Honours" list of municipal, county and sanitary officials who are taking part in the great war. A most gratifying response was made to our request that readers should assist by notifying us of cases within their knowledge, the number of communications which have reached us being in fact so great that the publication of a second list has now become necessary.

Bass, P., Middlesex County Council staff, with the East Surrey Regiment.

Bass, T., Middlesex County Council staff, with the 1st Surrey Rifles.

Beaumont, W. R. L., engineering assistant, Corporation of Birmingham, with the Warwickshire Yeomanry.

Bird, Walter Cyril, junior assistant in surveyor's department, Kettering Urban District Council, with the 6th (Service) Battalion Northamptonshire Regiment.

Blackwall, J. E., B.A., ASSOC.M.INST.C.E., county surveyor of Cambridge, Captain, with the 6th Battalion Notts and Derby Regiment.

Blake, F., clerk, sewage disposal works, Kingston-upon-Thames, has joined the colours.

Bolter, S., Middlesex County Council staff, with the Army Service Corps.

Bristol, O. H., Middlesex County Council staff, with the Westminster Dragoons.

Broom, H., Middlesex County Council staff, with the Queen's Westminster Rifles.

Burchell, H. W., Middlesex County Council staff, with the Queen's Westminster Rifles.

Buscombe, R. T., borough surveyor of Bodmin, with the Territorials.

Bushby, P., clerk in the office of the city engineer and surveyor of Brimingham (Mr. Henry E. Stilgoe, M.INST.C.E.), private, Warwickshire Yeomanry (Territorials).

Catton, Percy, assistant surveyor of Grays, who is a corporal in the 3rd Essex (Grays) Battery of the R.F.A., has, with the whole battery, volunteered and been accepted for foreign service. The battery two years ago won the King's Prize for shooting at Okehampton.

Chandler, E. R., clerk, Corporation of Birmingham, with Lord Kitchener's Army.

Chandler, G. W., engineering assistant, Corporation of Birmingham, with the Gloucestershire Yeomanry.

Cornock, Edward, second assistant engineer of Clydebank, has been called to the colours of the Royal Engineers.

Cossins, G. H., Middlesex County Council staff, with the Westminster Dragoons.

Crone, J. S., Middlesex County Council staff, with the London Scottish.

Davies, Dr. S. J., Middlesex County Council staff, with the Royal Army Medical Corps.

Davis, R. P., engineering assistant, Corporation of Birmingham, with the London Rifle Brigade, 5th City of London Regiment.

Dickinson, C., Middlesex County Council staff, with the 1st Surrey Rifles.

Dowling, F., second clerk, municipal stores department, Kingston-upon-Thames, has joined the colours.

Downer, J., Middlesex County Council staff, with the 1st Surrey Rifles.

Downing, A. N., clerk in the office of the city engineer and surveyor of Birmingham (Mr. Henry E. Stilgoe, M.INST.C.E.), with the 6th Battalion Royal Warwickshire Regiment.

Drake, P., Middlesex County Council staff, with the 1st Surrey Rifles.

Eckersall, P. G., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Eversett, W. J., inspector of nuisances, Congleton, has volunteered for service abroad, and has joined the 2nd London Sanitary Company.

Farrington, W. P., draughtsman and assistant in the office of the borough engineer and surveyor of St. Pancras (Mr. W. Nisbet Blair, M.INST.C.E.), has joined the colours of the 7th County of London Fusiliers.

Firman, W. H., surveyor's department, Teddington Urban District Council.

Fitch, J. T., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Hall, B., Middlesex County Council staff, with the Honourable Artillery Company.

Harland, A. E., clerk, Corporation of Birmingham, with Lord Kitchener's Army.

Harman, R. W., clerk in the office of the borough engineer and surveyor of St. Pancras (Mr. W. Nisbet Blair, M.INST.C.E.), is serving with the Queen's Westminster Rifles.

Hawkes, F., Middlesex County Council staff, with the Queen's Westminster Rifles.

Helliwell, R., Middlesex County Council staff, with the 13th County of London.

Hobbs, A. T., engineering assistant, Corporation of Birmingham, with the 6th Battalion Royal Warwickshire Regiment.

Howell, A. P., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Hunter, ——, sanitary inspector to the Maldens and Coombe Urban District Council, is on service as Captain.

James, R., messenger in the office of the city engineer and surveyor of Birmingham (Mr. Henry E. Stilgoe, M.INST.C.E.), Sergeant with the 6th Battalion Royal Warwickshire Regiment (Territorials).

Jukes, R. J., engineering assistant, Corporation of Birmingham with the 6th Battalion Royal Warwickshire Regiment.

Kewin, W., Middlesex County Council staff, with the City of London Roughriders.

King, F. B., Middlesex County Council staff, with the Queen's Westminster Rifles.

King, J. S., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Landen, G., second clerk to the borough surveyor of Kingston-upon-Thames (Mr. R. Hampton Clucas), has joined the colours.

Lander, R. C., Middlesex County Council staff, with the 2nd City of London Regiment.

Lovelock, H. W., assistant surveyor to the Godstone Rural District Council, has enlisted in the County of London Rifle Brigade for home or foreign service.

Lower, H. C., inspector of nuisances to the Rye Rural District Council, has joined the Army.

Lunn, H. E., second assistant to the borough engineer of Tunbridge Wells (Mr. W. H. Maxwell, ASSOC.M.INST.C.E.), has joined Lord Kitchener's Army, to be attached to the 7th Battalion of the Royal West Kent Regiment.

Lyles, C., assistant in collector's department, Kettering Urban District Council, with the 6th (Service) Battalion Northamptonshire Regiment.

Mackenzie, R., clerk in the office of the city engineer and surveyor of Birmingham (Mr. Henry E. Stilgoe, M.INST.C.E.), Sergeant, Royal Engineers (Territorials).

Mathew, H. B., engineering assistant, Corporation of Birmingham, with the 5th Buffs (Kent).

Moir, H. W., Middlesex County Council staff, with the Royal Army Medical Corps.

Moore, F. A., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Morrison, Peter, second assistant sanitary inspector of Clydebank, is serving with the Royal Engineers.

Murray, H. A., Middlesex County Council staff, with the Royal Army Medical Corps.

Nash, F. O. C., chief assistant, Birmingham Town Planning Department, Captain, 5th Battalion Northumberland Fusiliers (Territorials).

Neville, J. W., Middlesex County Council staff, with The Buffs.

Nicholson, W. A., surveyor to the Halstead Urban District Council, Essex, with the 8th Essex Cyclist Battalion. The battalion has volunteered for foreign service.

Noden, F. W., assistant building inspector, Corporation of Birmingham, with Lord Kitchener's Army.

Oakes, R., Middlesex County Council staff, with the Queen's Westminster Rifles.

Palmer, J. C., assistant sanitary inspector, Kettering Urban District Council, has joined Kitchener's Army.

Parker, H. J., surveyor to the Kettering Rural District Council, with the 6th (Service) Battalion Northamptonshire Regiment.

Perkins, H., assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Perry, F., Middlesex County Council staff, with the 6th City of London.

Pickmere, J. R., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

The Surveyor

And Municipal and County Engineer.

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Radford, F. M., engineering assistant, Corporation of Birmingham, with Lord Kitchener's Army.

Radford, H. S., Middlesex County Council staff, with the Honourable Artillery Company.

Robinson, R. A., Middlesex County Council staff, with the Honourable Artillery Company.

Rothwell, L. A., Middlesex County Council staff, with the Queen's Westminster Rifles.

Sedgwick, G., Middlesex County Council staff, with the Naval Volunteer Reserve.

Slatcher, W., Middlesex County Council staff, with the 13th County of London.

Smith, A. G., clerk, Corporation of Birmingham, with Lord Kitchener's Army.

Smith, C., Middlesex County Council staff, with the Royal Marine Reserves.

Spurgeon, H., Middlesex County Council staff, with the 13th County of London.

Thompson, A. C., ASSOC.M.INST.C.E., chief assistant to the borough engineer of Tunbridge Wells (Mr. W. H. Maxwell, ASSOC.M.INST.C.E.), has joined Lord Kitchener's Army, to be attached to the 7th Battalion of the Royal West Kent Regiment.

Thorn, R. F., pupil of the borough engineer and surveyor, Maldon (Mr. T. R. Swales, M.INST.C.E.I.), with the Essex Yeomanry; has volunteered for foreign service.

Toll, S., Middlesex County Council staff, with the Queen's Westminster Rifles.

Tozer, A., engineering assistant, Birmingham Corporation, Sergeant, Warwickshire Yeomanry (Territorials).

Tuffin, A. E., surveyor's department, Teddington Urban District Council.

Wallis, S., sanitary inspector to the Kettering Rural District Council, with the Northamptonshire Imperial Yeomanry.

Waters, B., clerk in the office of the city engineer and surveyor of Birmingham (Mr. Henry E. Stilgoe, M.INST.C.E.), with the 5th Battalion South Staffs Regiment.

Weston, C. F. R. N., chief assistant, Birmingham Special Works Department, Captain, Royal Engineers (Territorials).

Whitaker, John, articled pupil to the borough engineer of Accrington (Mr. W. J. Newton, ASSOC.M.INST.C.E.), has joined the 8th Manchester Territorials, and volunteered for foreign service.

Wiltshire, E., Middlesex County Council staff, with the Queen's Westminster Rifles.

THE WAR.

AUTOMOBILE ASSOCIATION MEMBERS AND WAR SERVICES.

The magnificent response by the members of the Automobile Association to the recent appeal for cars and motor cycles has enabled the association to play a very important part in the work of assisting the authorities. The numerous military duties undertaken have been of a varied description, such as taking generals to the different military centres to carrying inspectors on observation in connection with bridges and sentry posts; also the appointment of members with their cars for permanent duty at the various commands. Various recruiting depots around London have been supplied with cars. Recruiting tours comprising batches of cars are at work in different parts of the country. In London and other centres members' cars are being used for collecting recruits and bringing them to the stations. Cars have been provided for officers superintending the shipment of aeroplanes, &c. Other useful work includes assisting refugees, the Navy League, the National Service League and Red Cross work. On occasions fleets of fifty cars have been in attendance at given stations in connection with Red Cross work. Other organisations which have received assistance are the Local Government Board, Central Committee Women's Employment, Y.M.C.A., and the Prince of Wales' Fund. Motorists who are willing to convert their cars into ambulance vehicles at a reasonable cost are earnestly requested to communicate with the Secretary, Automobile Association and Motor Union, Fanum House, Whitcomb-street, London, W.

LOCAL AUTHORITIES AND THE WAR.

The Lord Mayor of Birmingham (Lieut.-Col. Ernest Martineau), commanding 6th Battalion Royal Warwickshire Regiment (Territorials), has gone on active service.

The city electrical engineer of Belfast reports that up to the present twenty-three of his staff have joined the colours, and that he is having the vacancies temporarily filled.

The assistant surveyor to the Royton (Lancs) Urban District Council, who is an officer in a Manchester regiment, has joined the colours, and it has been decided to keep his position open for him.

Gateshead Corporation have agreed that in the case of married employees on service the amount received from the Government shall be augmented to the amount they were receiving before being called out.

Taunton Town Council have agreed to the payment of such amounts to wives of married men as will bring their income up to the wages received by such men, and to single men a half-pay allowance during the war.

The Frome Urban District Council have resolved to pay to all employees who have gone to the front the difference between the Army pay, separation and other allowances, and the average wage which the employees were in receipt of before enlistment.

At a meeting recently of the Easington Rural District Council, the clerk, in reply to a member, said both the two surveyors (Messrs. G. Waterhouse and J. G. Heslop) and himself would be perfectly willing, if the age limit permitted, either to enlist or offer their services for any purpose required.

Bexhill Town Council have resolved to keep open the situations of those employees who have been called to the colours. The men will be paid such sums as, with the Government pay, will amount to full wages, except in cases where the wages exceeded £2 a week, for which special consideration will be made.

Many of the outdoor employees of the Middlesex County Council have joined different regiments. The council are keeping the positions of both the staff and employees open until they return, and are paying their full salaries and wages, less the amount each one receives from the War Office or the Admiralty, as the case may be.

At Tavistock Urban District Council on Saturday, Mr. F. Camble, surveyor, asked permission to join the Territorial Force for ambulance work, but as there are important works in hand which only Mr. Camble thoroughly understands it was felt that the preservation of the public health was of the highest importance, as the Local Government Board had recently pointed out to the council. It was resolved that, while

[illegible]

[illegible] Mr. H. A. Garrett, [illegible] P. [illegible] Mr. Garrett expected that the [illegible] Having it [illegible] that [illegible] was passing through a period of the greatest material decay. One [illegible] in the [illegible] which were being made by men on all sides. He had hoped to [illegible] but so [illegible] was allowed to leave. In his absence, Mr. Garrett felt sure that the work in the surveyor's department, under his deputy, Mr. C. Gillard, would not suffer.

Mr. L. A. Dibdin and Mr. H. A. J. Dibdin have volunteered for foreign service.

Mr. H. Cecil Foster, engineer and a director of the Essex Steam Rolling Association, Limited, 18, 19 and 20 Council Chambers, Southend-on-Sea, has joined the Seaforth Highlanders (Territorials).

Several of the employees of Messrs. Adams-Hydraulics, Limited, have been accepted for active service, among them being Mr. D. Hutton, their [illegible] who already hold the South African [illegible] with 5½ clasps, who has again volunteered.

The Ferroviaria Bar and Concrete Engineering Company, Limited, Queen Anne's Chambers, Westminster, S.W., inform us that, in spite of the fact that they have, like other firms in this country, temporarily lost the services of some of their staff, who have joined the colours, they are sufficiently organised to cope with work which may be placed with them as in normal times. They naturally desire to keep their staff fully employed without entailing upon them any financial sacrifices, and they therefore venture to ask customers to co-operate with them by proceeding immediately with any reinforced-concrete work they have on hand, and by placing any further inquiries with them. The company state that the whole of their staff is British, their business has been founded and [illegible] with British capital, of which not a single share is held by a foreigner, and the steel they sell has always been, without exception, British material and of British manufacture, and will continue to be so.

RUISLIP-NORTHWOOD TOWN-PLANNING SCHEME.

At the council meeting of the Ruislip-Northwood Urban District Council on Monday, September 14th, the approval of Parliament and the Local Government Board was received for their town planning scheme of some 6,000 acres in extent.

This terminates an enormous amount of time and labour which has been given to the scheme over a period of no less than 3½ years, and the congratulations of other authorities will be extended to the council and their officials on having successfully carried through the first urban district town planning scheme in England.

Timber in Water Main.—The cleansing of an 18-in. main belonging to the Airdrie, Coatbridge and District Water Trust resulted in the discovery of two pieces of wood, one 9 ft. and the other 11 ft. in length, in a section of the pipe.

A Grimsby Competition. The Grimsby Board of Guardians recently invited competitive designs from architects for the new receiving Home for Children at the workhouse. From the designs submitted to them for their inspection they have selected that of Mr. T. Waddingham, architect and surveyor, 89 Cleethorpe-road, who has accordingly been instructed to carry out the work for them. Mr. Waddingham is an old pupil of the borough surveyor's department. He resigned the position of surveyor to the Hebden Bridge Urban District Council in June last, in order to take up private practice at Grimsby.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Abercarn U.D.C. (September 8th. Mr. A. G. Drury).—£1,376 for the purchase and laying out of the Distillery Field as a recreation ground. It was stated that one of the objects of the council was to provide work to prevent distress, and that the scheme would be proceeded with forthwith.

Clay Cross U.D.C. (August 26th. Mr. W. M. Cross).—£400 for the purpose of water supply, including the execution of works in the township of Ashover. It was explained that some 16,000 gallons a day was running to waste from the Press Brook, and it was desirable that this should be secured for the use of the town, while it was thought that an even more productive supply could be obtained. It was also thought advisable to have increased storage capacity by erecting a tank or reservoir at the highest point of Clay Cross, to hold one day's supply.

Hinckley U.D.C. (September 9th. Mr. W. M. Cross).—£1,065 for the construction of a new pumping main at the Sketchley sewage disposal works. The surveyor, Mr. E. H. Crump, stated that the new main would pump 3,000 gallons per minute instead of 400 as at present.

Rotherham T.C. (September 9th. Mr. F. O. Stanbody).—£1,946 for the extension of the main sewer from Effingham-square to the outfall works at Aldwarke, and £700 for the purchase of a motor wagon.—The borough engineer, Mr. E. B. Martin, stated that the main sewer extension was rendered necessary owing to the very rapid growth of the population.

Southampton T.C. (August 24th. Mr. W. H. Collins).—£11,923 for the purchase of land for the erection of working-class dwellings under Part III. of the Housing of the Working Classes Act, 1890.—It was explained that the council contemplated the erection of 552 houses, approximately. The town clerk, Mr. R. R. Linthorne, stated that it was hoped to let the houses at economic rents, but he thought something would have to be borne by the rates.—(August 25th. Mr. R. G. Hetherington).—£36,500 for works of water supply, including the construction of a reservoir in Glen Eyre-road, Bassett, and the execution of certain other works there and at Otterbourne. The waterworks engineer, Mr. E. C. Rodda, stated that the daily demand varied from 3,500,000 to 4,000,000 gallons, and the reservoir capacity was barely sufficient to meet this.

Torquay T.C. (September 8th. Mr. H. Shelford Bidwell).—£16,000 for the electricity undertaking, £5,980 for the pavilion, and £500 for electrically illuminating the Princess Gardens.—Mr. C. W. Salt, borough electrical engineer, said a portion of the electricity plant was required at once, and that it was necessary that the new generating plant should be installed before the winter of 1915. With respect to the pavilion, Mr. H. A. Garrett, borough surveyor and architect of the pavilion, explained that the additional expenditure was in order to increase the general attractiveness and earning power of the building. Of the items, one of over £700 was for the glazed ornamental screen between the concert hall and café, and another was for £127 for the outside iron staircase leading to the roof overlooking the Princess Gardens.

APPLICATIONS FOR LOANS.

Bollington U.D.C.—£350 for improving the recreation ground.

Burnham (Somerset) U.D.C.—£2,900 for a sewerage scheme, and £485 for the purchase of part of the Berrow Water Company's undertaking.

Croydon T.C.—£1,800 for surface-water drainage.

Esher and the Dittons U.D.C.—£1,250 for private street improvement.

Harrogate T.C.—£762 for street works.

Hipperholme U.D.C.—£1,500 for road improvement.

Holywell R.D.C.—£13,500 for the erection of fifty-two workmen's houses.

Newport (Mon.) T.C. £[illegible], for the development of the Somerton estate and the erection of 100 houses.

Ramsgate T.C. £[illegible] for the extension of the East Cliff bathing station, and £1,065 for wood paving.

Scarborough T.C. £10,000 for the construction of a bathing pool and beach bungalows.

Tottenham U.D.C. £[illegible] for replacing [illegible] vehicles.

Westbury U.D.C. £[illegible] for the erection of [illegible] workmen's dwellings.

Westhoughton U.D.C. £12,000 for sanitary conversions.

Whiston R.D.C. £6,000 for sewage disposal works.

Wokingham T.C. £[illegible] for a housing scheme.

Worcestershire C.C. £10,000 for new offices.

LOANS SANCTIONED.

Ashton-under-Lyne T.C. £11,000 for the sewage disposal works.

Ashton-under-Lyne.—£426 for alterations to a school.

Barrow-in-Furness T.C. £650 for a public convenience.

Boston R.D.C. £8,340 for a housing scheme.

Bourne U.D.C. £11,230 for the purchase of the local gas undertaking.

Brierley Hill U.D.C.—£6,600 for the purchase of land for a cemetery.

Chingford U.D.C. £1,350 for road improvements.

Croydon T.C. £19,743 for the construction of the Thornton Heath-Purley relief road.

Dartford U.D.C.—£1,350 for a cemetery chapel.

Derby T.C.—£12,240 for a recreation ground.

East Stow R.D.C.—£1,739 for works of water supply.

Epsom R.D.C.—£850 for private street improvements.

Esher and the Dittons U.D.C.—£580 for Ember Court-road sewer (for thirty years).

Fermoy U.D.C.—£4,580 for a housing scheme.

Ilford U.D.C.—£8,750 for main road improvement, and £4,600 for sewage disposal works.

Holsworthy U.D.C.—£1,400 for the erection of workmen's dwellings.

Hull T.C.—£14,448 for a tuberculosis hospital.

Jarrow T.C. £5,000 for road improvements.

Lathom U.D.C.—£800 for works of water supply.

Lymington T.C.—£1,845, further loan for works of sewerage.

Maldens and Coombe U.D.C.—£2,450 for the provision of a refuse destructor. The sanction granted in 1913 for a loan of £1,600 for the same purpose has been cancelled.

Penzance T.C.—£256 for public conveniences.

Rhyl U.D.C.—£3,777 for dredging works, £231 for pumping station buildings, and £168 for new sewering machinery.

Riccall R.D.C. £3,[illegible]0 for a water supply for Barlby.

Sutton (Surrey) U.D.C.—£1,778 for the Rose Hill improvement.

Thames Ditton U.D.C.—£850 for works of sewerage.

Torrington T.C.—£11,000 for the erection of workmen's dwellings.

Warminster R.D.C.—£1,834 for a housing scheme.

Warrington T.C.—£1,060 for road widening.

Woking U.D.C. £18,000 for improvements at the sewage works.

FORTHCOMING INQUIRIES.

SEPTEMBER.

		£
21.	**Peterborough.** For water main extension (Mr. R. H. Bicknell)	150
21.	**Saffron Walden.** For a housing scheme (Mr. Courtenay Clifton)	6,500
22.	**Bath.** For the purchase of the Pump Room Hotel (Mr. Edgar Dudley)	18,000
22.	**Blackburn.** For the erection of a fire station (Mr. W. O. E. Meade-King) ...	31,000
22.	**Liverpool.** For the provision of a police station (Mr. F. O. Stanford)	1,498
22.	**Morley.** For sewer construction (Mr. R. G. Hetherington)	877
22.	**Plymouth.** For the construction of a siding (Mr. P. M. Crosse-[illegible])	1,900
22.	**Swansea.** For bridge construction (Mr. A. G. Drury)	4,750
22.	**Yarmouth.** For works of paving (Mr. R. H. Bicknell)	5,000
23.	**Clayton West.** For works of sewage disposal (Mr. R. G. Hetherington)	5,739
23.	**Kidderminster.** For works of water supply (Mr. H. Shelford Bidwell) ...	1,500
23.	**Littlehampton.** For hospital extension (Dr. W. W. E. Fletcher)	3,000
23.	**Mountain Ash.** For the provision of a recreation ground (Mr. Edgar Dudley)	3,000
23.	**Staines.** For works of sewage disposal (Mr. W. M. Cross)	29,056
23.	**Swansea.** For bridge construction and water mains extension (Mr. A. G. Drury)	10,629
23.	**Wolstanton.** For the provision of a cemetery (Mr. F. O. Stanford) ...	1,500
23.	**Yeadon.** For road widening (Mr. W. O. E. Meade-King)	1,000
24.	**Enfield.** For the provision of a sewage filter (Mr. W. M. Cross) ...	1,800
24.	**Grimsby.** For road widening (Mr. W. O. E. Meade-King)	4,990
24.	**Neath.** For works of water supply (Mr. A. G. Drury)	2,500
24.	**Sedbergh.** For works of water supply (Mr. R. G. Hetherington)	911
24.	**Willesden.** For private street works (Mr. M. K. North) ...	2,617
25.	**Llantrisant.** For works of water supply (Mr. A. G. Drury) ...	19,900
25.	**Mansfield.** For street improvements (Mr. W. O. E. Meade-King)	500

TOWN PLANNING.

19. **Thames Ditton.** (Mr. Thomas Adams)
23. **Manchester.** (Mr. George L. Pepler) ...
29. **Birkenhead.** (Mr. George L. Pepler) ...
30. **Wallasey.** (Mr. George L. Pepler)

OCTOBER.

6. **York.** (Mr. George L. Pepler) —

Association of Managers of Sewage Disposal Works.—The meeting of this body which it had been arranged to hold at Burton on the 26th inst. has been postponed until next year.

The Destruction of Insects: "Pax."—"Kill that fly" is an injunction to which in recent years we have grown fairly accustomed, but a considerably more efficacious method of ridding ourselves not only of flies, but of other even more objectionable insects would seem to be provided by the discovery of a compound which is claimed to render not only human beings, but animals and vegetation immune from the attacks of these pests. The preparation is known by the name of "Pax," and already, we understand, it is being employed on an extensive scale by a number of public authorities. Experiments have demonstrated that when it is sprayed on to refuse of any kind the result is an immediate disappearance of all forms of insect life, a fact which at once suggests that its adoption on sewage farms and destructor works would be likely to do much in the direction of removing a nuisance that is only too frequently a cause for complaint on the part of those living in the vicinity of such undertakings. Flies are stated never to be found in rooms where it is used; insects that come in actual contact with it drop dead instantly; but it is quite harmless to human beings, as evidence of which it may be mentioned that one of the forms in which it is obtainable admits of its use in the bath as a preventive of stings and bites. "Pax," 14 Caxton House, Westminster, S.W., will gladly supply full particulars on application.

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Derby £3,050, Rhyl £4,000, St. Anne's £6,500, Scarborough £10,000, housing and town planning—Barnsley, Margate £9,470, roads and materials—Bognor £8,194, Croydon £60,131, Norfolk, Swansea, Tottenham £15,457; sewerage and sewage disposal—Bulkington £8,500; water, gas and electricity—Poole £20,000. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Derby T.C.—The London-road recreation ground is to be laid out at an estimated cost of £5,000, and it has also been agreed to proceed with the construction of cattle market sheds at the Spot, at an estimated cost of £3,050.

Kingsbridge U.D.C.—The council last week decided to proceed with the erection of the walls and entrance to the new cattle market, and also to sink a well.

Lytham U.D.C.—The surveyor, Mr. A. J. Price, has received instructions to prepare a rough sketch and estimate for a bathing pool on the foreshore.

Malton R.D.C.—A plot of land has been purchased for the construction of a reservoir at High Hutton.

Newcastle-upon-Tyne T.C.—The Estate and Property Committee have accepted the tender of Mr. S. F. Davidson, of Newcastle, for the erection of baths at Benwell, Heaton and Walker.

Rhyl U.D.C.—The council have accepted the tender of Mr. A. Torkington, Rhyl, at £596, for the erection of the new administrative block at the isolation hospital.—The council have forwarded to the Local Government Board a scheme for a new amphitheatre to cost £4,000, and are now considering plans for the new pier scheme and the laying out of a portion of the sea front in marine gardens.

St. Anne's U.D.C.—The council have adopted a scheme for sea-water baths estimated to cost £6,500.

Scarborough T.C.—The Public Parks and Entertainments Committee have been authorised to proceed with the construction of a bathing pool at the south side of Peasholm slipway, abutting on the Royal Albert-drive, in the North Bay, at an estimated cost of £10,000. The scheme includes the erection of six more beach bungalows and bathing pavilions on the cliff side, immediately opposite the site of the bathing pool.

Yarmouth T.C.—The Baths Committee recommend the construction of an open-air bath on a site to the east of the Aquarium, at an estimated cost of £3,500.

HOUSING AND TOWN PLANNING.

Barry T.C.—It has been agreed to purchase land for the purpose of building twelve workmen's dwellings.

Caerphilly U.D.C.—The purchase has been completed of land on the Grange estate for a housing scheme.

Evesham T.C.—A resolution has been adopted to build fifty-two houses, and Mr. H. E. Dicks, of Evesham, has been appointed architect. The dwellings will be planned mainly upon the model of those erected by the Evesham Rural District Council at Broadway and Offenham.

Greenock T.C.—The commissioners of the Local Government Board, who inquired into the local housing conditions, recommend the corporation to proceed with the erection of 250 houses, and with a similar scheme a year hence, the class of house to be determined by arrangement between the board and the corporation. The report is, in the meantime, for the observation of the corporation only.

Hay U.D.C.—The Local Government Board have advised the council to provide a few working-class dwellings.

Holywell R.D.C.—A decision has been reached to build twenty-two workmen's houses, at an estimated cost of £5,230, on a site purchased from Lord Mostyn, and thirty houses at Bagilt, at an estimated cost of £7,695. The houses are to be let at a rental of 4s. 3d.

[illegible] Further schemes in other parts of the district are under consideration.

Margate T.C.—A scheme has received approval for [illegible] £9,470.

Wrexham R.D.C. The engineer, Mr. J. Price Davies, has been taken to prepare town planning schemes for the district.

ROADS AND MATERIALS.

Belfast T.C.—The city surveyor, Mr. H. A. Cutler, has received instructions to prepare a report upon a proposal for the construction of a new road running from a point near Belfast Castle, on the Antrim road, to the extreme southern boundary of the city.

Bodmin T.C.—The council are asking the county council for a grant of £200 towards improving the road from Dunmere-hill to Little Kirland-road, and £250 for widening, grading, and strengthening the road from St. Nicholas to Carminnow Cross. They have also suggested to the county council the desirability of widening the metalled carriageway in the Lostwithiel-road and Cooksland-road.

Bodmin T.C.—The county council have been asked for a grant of £500 for the purposes of road improvement and widening.

Bognor U.D.C.—The council have deferred for a month the consideration of the proposed Lansdowne improvement, consisting of the widening of the promenade and the highway from opposite West-street to the pier, by carrying out to sea the existing sea defences and thus enabling the road there to be constructed 50 ft. wide and the promenade 33 ft. wide. The estimated cost of this work is £8,194.

Brighton T.C.—The Works Committee have accepted the tender of the Slieve Donard grey granite quarries to supply, in accordance with the specification prepared by the borough surveyor, Mr. H. Tillstone, 2,000 ft.-run 6-in. by 10-in. granite edge kerb, 3,000 ft-run 12-in. by 6-in. granite flat kerb, and 3,000 ft.-run 12-in. by 6-in. granite flat channel, at 1s. 4d. per foot, 1s. 7½d. per foot, and 1s. 7d. per foot respectively.

Croydon T.C.—Works of kerbing, channelling and paving (with asphalt and granite setts), estimated to cost £60,131, are to be carried out.

Dundee T.C.—The tender of Mr. David Horsburgh, Dundee, at £657, has been accepted for the paving of Ann-street.

Edmonton U.D.C.—The surveyor, Mr. Cuthbert Brown, has been authorised to communicate with the county council, the Road Board and the Government with a view to ascertain what grants they would be prepared to make in aid of a scheme for widening Silver-street and improving and widening Angel-road.

Holyhead U.D.C.—The surveyor, Mr. A. Asquith, has received instructions to prepare plans of a proposed new road between Porthyfelin-road and Llaingoch-road.

Leicester T.C.—A scheme for the improvement of Welford-road is to be carried out at an estimated cost of £3,000.

Norfolk C.C.—The county surveyor, Mr. T. H. B. Heslop, at a meeting of the Eastern Highways Committee on Saturday, stated that the scheme for the relief of unemployment was before the Relief Committee at the last meting, and received their sanction, and was referred to the Highways Committee for their approval and any suggestions they might make. The scheme provided for road widening at Morston, Colkirk, Brisley, Overstrand, Cromer (Carrington Villas and Mr. Barclay's Farm), Ludham, Belaugh, Ormesby, Wells (near railway crossing), Burnham, Wootton, Bilney, Massingham, Alby, Yaxham, Foxley, Trowse-street, and improvements at various corners, the estimated cost being £15,770. The proposal, it was stated, came from the Road Board. The committee adopted the scheme as a general basis to work upon.—The committee also decided to give effect to the requirements of the War Office for the construction of a military road practically from Yarmouth to Heacham, 5 miles from the coast, and parallel with the coast for that distance.

Romford U.D.C.—The surveyor, Mr. Herbert T. Page, has received instructions to negotiate with the owners affected by the proposed improvement of Petticoat-lane and Brewers-lane, and to prepare a scheme for submission to the county council.

South Shields T.C.—Granite sett paving is to be laid in Frederick-street at an estimated cost of £1,277.

Sutton (Surrey) U.D.C.—The surveyor, Mr. W. H. Grieves, has been asked to submit an estimate for taking up Downs-road.

Swansea T.C.—Schemes of road improvement estimated to cost £15,667 were recommended by the Highways Committee.

Tottenham U.D.C.—It has been agreed to repave by direct labour the carriageway of Green-lanes with wood on a 12-in. concrete foundation in lieu of the existing 6-in. four-lane, at an estimated cost of £15,457, subject to the Middlesex County Council defraying the cost, Green-lanes being a "main" road. It is estimated this will provide work for 300 men for twenty-four weeks.

Wells R.D.C.—The council have passed a resolution in support of a scheme for a new road from Wells to Cheddar.

York T.C.—The city engineer, Mr. F. W. Spurr, has received instructions to prepare plans and specifications of a proposed new road from Salisbury-terrace to Waterworks-lane, a proposed road from Bootham-row to Terry-avenue, and to report with respect to other reconstruction.

SEWERAGE AND SEWAGE DISPOSAL.

Bulkington U.D.C.—The council have approved a scheme of sewage disposal which is estimated to cost £8,500.

Feckenham U.D.C.—A report has been prepared on proposed sewage works, which are estimated to cost £430.

Tottenham U.D.C.—It has been decided to demolish the old tanks at the sewage disposal works, at an estimated cost of £3,000.

Willington U.D.C.—A tender at £234 has been accepted for the extension of the sewage disposal works.

Workington T.C.—Upon the advice of the borough surveyor, Mr. H. B. Williams, certain sewerage work at North Side, for which it had been decided to advertise for tenders, will be carried out departmentally in the event of unemployment becoming acute.

WATER, GAS, AND ELECTRICITY.

Brighton T.C.—It is proposed to effect water main extensions at an estimated cost of £873.

Castle Ward (Northumberland) R.D.C.—Messrs. Taylor & Wardlin, civil engineers, of Newcastle-on-Tyne and London, have been instructed to prepare a scheme and report upon the water supply of the parish of Whalton. The water will probably be pumped from a well.

Clogher R.D.C.—A report by Mr. F. E. Townsend advising the preparation of a water supply scheme for Augher and Clogher, has been referred to a committee for consideration.

Cromer U.D.C.—The council have accepted the tender of the gas company, at £341 per annum, for lighting the town. The number of lamps is 182.

Foleshill R.D.C.—It has been decided to sink a borehole adjacent to one of the Newdegate Colliery Company's shafts, for the purpose of a water supply for Bedworth.

Poole T.C.—The question of the proposed new water undertaking, involving an expenditure of about £30,000, has been referred to a special meeting of the council in committee.

Sutton (Surrey) U.D.C.—The surveyor, Mr. W. H. Grieves, has received instructions to submit a report on the aëration and filtration of water.

Tottenham U.D.C.—Subject to the agreement with the Water Board, it has been agreed to proceed at once with replacing the obsolete hydrants, at an estimated cost of £1,100.

MISCELLANEOUS.

Norwich T.C.—The city engineer, Mr. A. E. Collins, has received instructions to build four water carts, at an estimated cost of £120, to replace those sold to the Government.

Southall-Norwood U.D.C.—The council have had under consideration various schemes prepared by their engineer, Mr. Reginald Brown, M.INST.C.E., for the purpose of finding useful work in view of any distress which might arise owing to the war, and have approved the following to be carried out if the necessity arises: Fifty-four workmen's houses; lakes at Southall Park and the recreation ground; and the laying out of the grounds of the Manor House recently purchased by the council. In addition to these works the council are carrying out sewerage and road works at a cost of something like £4,000. The total cost of these works is estimated to amount to about £27,000, and the greater portion of the money will be spent on labour.

Tottenham U.D.C.—The engineer, Mr. W. H. Prescott, reported lately that there are at present from 80,000 to 90,000 loads of clinker deposited on the refuse destructor site. The council had experienced difficulty in disposing of the refuse, offers to give it away having been made from time to time. Unless the clinker could be disposed of free of cost, considerable expenditure must sooner or later be incurred in having it carted away. It was therefore recommended that the clinker should be removed and placed round the outside edge of the whole of the Marshes to form a footpath of an average width of 12 ft., subject to a grant from the Local Government Board. The estimate of the cost was £3,223, of which £2,400 would be for labour, and it would engage eighty-eight men for twenty-four weeks. The council have also decided to plant trees on the Marsh at a cost of £112, of which labour would absorb £193, and it would employ eight men for twenty-four weeks. This was also subject to the Local Government Board making a grant.

PERSONAL.

Mr. W. T. Ward, deputy surveyor to the Llandudno Urban District Council, has had his salary advanced from £200 to £225 per annum.

Mr. Robert A. Corry, late assistant surveyor to the Antrim County Council, has been granted a superannuation allowance of £80 per annum.

Mr. M. Oliver has been appointed to act as deputy surveyor of Bodmin during the absence of the borough surveyor (Mr. R. T. Buscombe) with the Territorials.

Mr. Colin H. Macfarlane, burgh surveyor and cleansing superintendent of Rutherglen, has been appointed assistant superintendent of cleansing to the Glasgow Corporation, at a salary of £250.

Mr. R. G. Gibson has left Messrs. Ham, Baker & Co., Limited, whom he represented in the Midlands for a number of years, and is now travelling for the Anglo-American Petroleum Products Company, whose road materials include Mexphalte and Fluxphalte.

Mr. Henry Burton, of Enfield, Middlesex, timber merchant, creosoter, and paving-block manufacturer, a partner in the firm of Messrs. Thomas Gabriel & Sons & Burton's, who died recently at the age of sixty-seven, has left estate of the value of £21,808.

Mr. H. K. Liversidge, junior assistant in the surveyor's department, Great Crosby, and a member of the 6th Battalion King's Liverpool Regiment, was, we regret to state, killed by a train last week while guarding the London and Brighton Railway line near Redhill.

Mr. G. M. Seals, assistant surveyor to the Maldens and Coombe Urban District Council, who is fully qualified by examination to act as inspector of nuisances under the Public Health Act, will assist in carrying on the work of the sanitary department during the absence on military service of Captain Hunter, the sanitary inspector.

Mr. H. E. Lunn, B.SC., second assistant to the borough engineer of Tunbridge Wells, who has joined Lord Kitchener's Army, was instrumental in forming a local company of professional and business men, seventy-eight of whom recently had an enthusiastic send-off by the mayor and corporation. Of this number no fewer than fifteen were borough officials.

Mr. H. B. T. Wakelam, B.A.(CANTAB.), (late Marlborough College and Cambridge University Officers' Training Corps), only son of Mr. H. T. Wakelam, county engineer of Middlesex, has gone to the Front. Gazetted to the Royal Fusiliers as second lieutenant on the Wednesday, he left England with his battalion on the Friday night following. He is well known as

Rugby football both in connection with Cambridge University and the Harlequins.

Mr. D. E. Lloyd Davies, an engineer of Aix, has been appointed city engineer of Cape Town at a salary of £2,000 a year. The appointment was made on July 29th, upon a unanimous recommendation (after a review of Mr. Davies by the Finance Committee of the Cape Town Corporation). Mr. Lloyd Davies was formerly second engineer of Birmingham, and has had a wide and varied experience as a consulting engineer, dealing particularly with respect to [illegible] Sewage Disposal.

FOR OTHER ADVERTISEMENTS

See End of Paper.

LANGPORT RURAL DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

The Council invite applications from qualifying Engineers and Surveyors for the appointment of a Surveyor's Assistant. Salary at the rate of £75 per annum, payable monthly.

The person appointed will act under the supervision of the Surveyor and perform such duties as he may require.

Applications, in candidate's own handwriting, stating age and qualifications and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than first post on Tuesday next, 22nd instant.

(By order)
EDWD. Q. LOUCH,
Clerk to the Council.

Council Offices,
Langport, Somerset.
September 16, 1914. (1,933)

BUXTON URBAN DISTRICT COUNCIL.

ROAD FOREMAN AND BUILDING INSPECTOR.

The above Council invite applications for the combined appointment of Road Foreman and Building Inspector.

Applicants must be between 30 and 45 years of age, thoroughly experienced in the construction of macadam and paved roads, sewers, and general highway administration, and accustomed to the control and supervision of men and team labour.

Preference will be given to applicants with municipal experience in similar capacity.

Remuneration will be at the rate of 37s. 6d. per week, rising by instalment to £2 5s., on recommendation of the Surveyor.

Forms of application and particulars of duties may be obtained from the undersigned, to whom applications are to be forwarded not later than Thursday noon, October 1st next.

F. LANGLEY,
Engineer and Surveyor.

Town Hall,
Buxton.
September 16, 1914. (1,937)

ASSISTANT ENGINEERS required for the East Africa Protectorate Public Works Department, for not less than twelve months, with possible extension. Salary £300. Free first-class passages and quarters. Age 22-35. Candidates should have good technical education and be Associate Members of the Institute of Civil Engineers, or have passed some examination qualifying for admission as such, and possess practical experience on civil engineering works. Apply at once by letter to the Crown Agents for the Colonies, Whitehall Gardens, London, S.W. (1,941)

ASSISTANT ENGINEERS required by the Government of the Gold Coast for the Public Works Department, for two tours of twelve months, with possible extension. Age 25-40. Salary £350-£10—£400. Furnished quarters and first-class passages. Two months' leave in England on full salary after each tour, increased to four months if returning. Candidates should have had a good technical education, a regular training as a civil engineer, and a practical knowledge of surveying, levelling, and estimating, particularly in regard to ordinary municipal work and building construction. Associate Membership of the Institution of Civil Engineers essential. Apply at once to the Crown Agents for the Colonies, Whitehall Gardens, London, S.W. (1,942)

FAREHAM RURAL DISTRICT COUNCIL.

LEE-ON-THE-SOLENT MAIN SEWERAGE.

RESIDENT ENGINEER.

The Fareham Rural District Council invite applications for the appointment of a Resident Engineer in connection with the above, which consists of about 4 miles of Sewers including Sea Outfall Pipe and Submarine Work.

Considerable experience in the supervision of Sewerage Works is essential, and the candidate must be able to test materials, set out work, use the various surveying instruments, and measure up work done.

The person appointed will be required to work under the direction of the Engineer, Mr. Wilberforce Cobbett, ASSOC.M.INST.C.E., and to devote the whole of his time to the work during the contractor's working hours.

The work is expected to last twelve months, and the appointment will be subject to one month's notice on either side.

The salary will be 3½ guineas per week.

Applications, endorsed "Resident Engineer," stating age and qualifications, accompanied by copies of three recent testimonials, to be sent to the undersigned not later than 10 o'clock a.m. on Thursday, the 8th October, 1914.

The successful applicant will be expected to reside at Lee.

Applicants who canvass any Member of the Council, either directly or indirectly, will be disqualified.

ALFRED LAKER,
Clerk to the Fareham Rural District Council.
97 West-street,
Fareham, Hants. (1,939)

COUNTY BOROUGH OF SOUTH SHIELDS.

TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.

Applications are invited by the above-named Council for the appointment of a temporary Assistant in the Borough Engineer's Department. Applicants must be good draughtsmen, with a thorough knowledge of surveying and levelling, and preference will be given to one having had experience in a municipal office. Salary, 35s. per week.

Applications, stating age, experience and qualifications, together with copies of three recent testimonials, and stating the earliest date on which the applicant can take up his duties if appointed, must be delivered to the undersigned on or before Thursday, October 1, 1914.

LESLIE ROSEVEARE,
(1,934) Borough Engineer.

ST. AUSTELL RURAL DISTRICT COUNCIL.

Tenders are invited for the construction of a tunnel, 500 yds. in length, or thereabouts, with the necessary airshafts, and for the laying of a stoneware pipe sewer therein, and extension of the same some 2,000 yds. in all, with the requisite manholes, &c., so as to connect the sewerage system of Mount Charles with that of Charlestown.

Plans and Specifications may be seen at the office of Mr. W. H. Moffat, C.S.I., the Surveyor to the Council, Council Offices, St. Austell, or at Messrs. Henderson & Son, the Engineers, Lemon Quay, Truro, any morning between the hours of 10 and 12.

A deposit of £3 3s., which will be refunded on the receipt of a *bonâ-fide* Tender, will be required.

All Tenders must be submitted to me on or before Wednesday, the 30th inst. The lowest or any Tender will not necessarily be accepted.

JOHN STEPHENS,
Clerk to the Council.

St. Austell.
September 16, 1914. (1,936)

BOROUGH OF EALING.

DESTRUCTOR AND SEWAGE WORKS MANAGER.

The Town Council of this Borough invite applications for the post of Destructor and Sewage Works Manager at their Southern Works, South Ealing. Commencing salary 50s. per week, together with house (rent free), coal and light.

Applicants aged between 35 and 45 must have held a similar appointment, and be capable of taking charge of a Staff of between 40 and 50 men, and be thoroughly conversant with the working of Destructors, the running of Steam and Hydraulic Machinery.

and the working of a Chemical Precipitation and Bacterial Filtration Sewage Works.

A list of duties and other particulars will be forwarded upon application.

Applications, in Candidate's own handwriting, endorsed "Destructor and Sewage Works Manager," enclosing copies of not more than three recent testimonials, to be delivered to the undersigned not later than first post on Tuesday, the 29th day of September, 1914.

W. R. HICKS, M.INST.C.E.,
Borough Engineer and Surveyor.

Town Hall,
Ealing, W.
September 16, 1914. (1,938)

HANWELL URBAN DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the supply of

(1) Broken Guernsey Granite.
(2) Distilled Tar.

Forms of Tender and further particulars may be obtained on application at the Council Offices, Hanwell.

Tenders to be delivered to the undersigned not later than the 28th September, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

Any person, firm or company canvassing any Member of the Council will be disqualified for receiving orders or contracts from the Council.

(By order)
PERCY SCOTT,
Clerk to the Council.

Council Offices,
Hanwell, W.
September, 1914. (1,932)

CITY OF LEEDS.

LEEDS CORPORATION ACT, 1908 (SEWERAGE).

SEWAGE DISPOSAL SCHEME AT THORPE STAPLETON.

CONTRACT No. 50.

Consisting of the execution of the following sections of the work on the Sewage Works Lands at Thorpe Stapleton:—

Part No. 1.—Three Screening Chambers, Screen-house, three Detritus Pits, two Mixing Chambers, Distributing Chamber and all accessories.

Part No. 2.—Four Precipitation Tanks, Main Gauging Chamber, Storm Overflow, Storm Overflow Culvert and Outlet, &c.

Part No. 3.—Eighteen acres of Bacteria Beds, complete with Silt Mains, Effluent Channels and Culverts and Gauging Chambers, &c., including the laying of Cast-iron Feed Mains.

To Public Works Contractors.

The Sewerage Committee of the Leeds Corporation are prepared to receive Tenders for the above work.

The Contract Drawings may be inspected, and copies of the Specification, Bills of Quantities, Form of Tender, &c., can be obtained at the office of the Sewerage Engineer (Mr. Geo. A. Hart, M.INST.C.E.), 26 Great George-street, Leeds, on and after Monday, the 5th October, 1914, upon payment of a deposit of £10, which will be returned on receipt of a *bonâ-fide* Tender. Cheques must be crossed, and made payable to the City Treasurer, Leeds.

Tenders must be on the official forms supplied, enclosed and sealed in the endorsed envelope provided, and delivered at the Town Clerk's Office, Pearl Chambers, East-parade, Leeds, not later than 10 a.m. on Wednesday, the 21st October, 1914.

The Corporation shall not be bound to accept the lowest or any Tender.

(By order)
ROBERT E. FOX,
Town Clerk.

Town Clerk's Office,
Pearl Chambers,
East-parade, Leeds.
September 30, 1914. (1,935)

WANTED. Second hand 6-ton Steam Roller. Write, stating age, Maker's number, weight empty and in working order, and full particulars. Box 1,466, Office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (1,940)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

A meeting of the institution will be held in the East Midland District at Cleethorpes to-morrow (Saturday).

Programme.

11.30 a.m.—By permission of the Cleethorpes Urban District Council, members will assemble in the council chamber and will be welcomed by the chairman of the council (Alderman Wm. Grant, J.P., C.C.).

Papers by Mr. C. H. Waithman, Assoc.M.INST.C.E., on "The Municipal Works of Cleethorpes," and by Mr. J. S. Alford, M.INST.C.E., on "The Cleethorpes New Sewerage Scheme and Outfall Works," which will be taken as read.

Discussion.

12.15 p.m.—Members will proceed to inspect the council depot and the refuse destructor and sewage pumping station (both approaching completion), fire station, &c., underground conveniences, and pier approach shelter. Motor chars-à-banc will be provided by kind permission of Mr. H. L. White, tramways manager.

1.30 p.m.—Luncheon at Cliff Hotel (tickets 2s. 6d. per head).

2.45 p.m.—Members will proceed along the Kingsway, inspecting *en route* the new pavilion, underground convenience, meteorological station, &c. Motor chars-à-banc will again be provided to take members to outfall sewerage works (details of construction, which will be explained by Mr. Alford), after which, time permitting, members will return to Cliff Hotel by a circuitous route.

5 p.m.—Members will reassemble in the council chamber for tea (provided by Mr. C. H. Waithman).

Resume discussion.

E. H. Crump, Assoc.M.INST.C.E.,
Hon. District Secretary.

Hinckley.

HINCKLEY MEETING.

An East Midland District meeting is to be held at the council offices, Hinckley, on Saturday, October 3rd.

Programme.

10.45 a.m.—Meet at the council offices, Hinckley, to discuss general district business.

11.15 a.m.—The members and visitors will be received by the chairman (Mr. G. Kinton, J.P.), and members of the Hinckley Urban District Council.

11.30 a.m.—Discussions on the following papers—"Eleven Years' Municipal Work at Hinckley," by Mr. E. H. Crump, Assoc.M.INST.C.E., F.S.I., engineer and surveyor to the Hinckley Urban District Council; and "By-laws and the Housing Question," by Mr. W. H. Court, Assoc.M.INST.C.E., borough engineer's department, Leicester.

12.45 p.m.—Inspection of the public baths adjoining the council offices.

1 p.m.—Luncheon at the Union Hotel at the kind invitation of the chairman and members of the Hinckley Urban District Council.

2.15 p.m.—Proceed in motor conveyances (at a charge of 3s. per person) to inspect the workmen's dwellings erected and in course of erection in Rugby-road, &c., and thence to the Snarestone Waterworks, 14 miles distant, to inspect the pumping station, &c., where tea will be provided by Mr. E. H. Crump.

4.15 p.m.—Leave Snarestone and drive to Gopsall Park, where members will be given the opportunity of inspecting the gardens, by kind permission of Earl Howe.

6 p.m.—Arrive at Hinckley Railway Station.

E. H. Crump, A.M.I.C.E., *Hon. District Secretary.* Hinckley.
E. G. Mawbey, M.INST.C.E., *District Chairman.* Leicester.

J. W. Dudley Robinson, F.S.I., F.I.ND., *Secretary.*
92 Victoria-street, Westminster, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

THIRD DIVISION CLERK. September 19th.—Pontypridd Rural District Council. £70—£100 per annum.—Mr. W. F. Adams, deputy town clerk.

CLERK OF WORKS. September 19th.—Wallasey Education Committee. £3 3s. per week.—Mr. H. W. Cook, town clerk.

SURVEYOR'S ASSISTANT. — September 21st.—Pontypridd Urban District Council. £60—£90 per annum.—Mr. J. C. Jones, clerk.

GENERAL FOREMAN.—September 21st.—Market Harborough Urban District Council. 35s. per week.—Mr. H. G. Coales, surveyor, Council Offices.

ASSISTANT IN SURVEYOR'S OFFICE.—September 22nd.—Corporation of Godalming. 30s. per week.—Mr. Alan Bromly, borough surveyor.

SURVEYOR'S ASSISTANT.—September 22nd.—Corporation of Morley. £104 per annum.—Mr. Fred Thackray, town clerk.

INSPECTOR OF NUISANCES.—September 23rd.—East Kerrier Rural District Council. £80—£100.—Mr. M. H. Truscott, clerk, The Square, Penryn.

ASSISTANT SURVEYOR.—September 26th.—Bridgwater Rural District Council. £85 per annum.—Mr. W. A. Collins, surveyor.

SURVEYOR AND INSPECTOR.—September 26th.—Swaffham Rural District Council. £110 per annum.—Mr. S. Matthews, clerk.

DIVISIONAL SURVEYOR.—September 26th.—East Suffolk County Council. £135—£150 per annum.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

GENERAL ASSISTANT.—September 26th.—East Suffolk County Council. £90—£120 per annum.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

CLERK OF WORKS.—September 29th.—Portslade-by-Sea Urban District Council. £2 10s. to £3 per week.—Mr. Ernest H. Kempe, Council Offices.

TEMPORARY ASSISTANT.—September 29th.—Corporation of Tunbridge Wells. £3 per week.—Mr. W. H. Maxwell, borough and water engineer.

SURVEYOR.—September 30th.—Blaenavon Urban District Council. £130 per annum.—Mr. I. G. Gwyn-Thomas, clerk.

CHIEF DRAUGHTSMAN.—September 30th.—City of Westminster. £200—£250 per annum.—Mr. John Hunt, town clerk, City Hall, Charing Cross-road, W.C.

CLERK OF WORKS.—September 30th.—Axminster Rural District Council. £3 3s. per week.—Mr. C. Forward, clerk.

BOROUGH SURVEYOR'S ASSISTANT.—September 30th.—Smethwick Town Council. £120 per annum.—Mr. A. Hosken, borough surveyor.

—ROAD FOREMAN.—October 1st.—Hampton Urban District Council. £2 10s. per week.—Mr. Sidney H. Chambers, surveyor.

ARCHITECT.—October 5th.—Aberdare Education Committee.—Mr. T. Botting, director of education, Education Offices.

TEMPORARY ASSISTANTS.—No date.—Ruislip-Northwood Urban District Council.—The Clerk, Council Offices, Northwood, Middlesex.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BROMYARD.—September 26th.—Plans and specifications for four cottages, at a cost of £600, for the urban district council.—Mr. Albert Bush, clerk, Broad-street, Bromyard.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

LLANDILOFAWR.—September 21st.—For the construction of a bridge, for the rural district council.—Mr. Evan Jones, surveyor.

MONMOUTH.—September 21st.—For the erection of a school, for the Education Committee.—Mr. John Bain, County Council Offices, Newport.

BRIDLINGTON.—September 21st.—For the erection of ten houses, for the corporation.—Mr. E. R. Matthews, borough surveyor.

YORK.—September 21st.—For the erection of weights and measures offices, for the corporation.—Mr. F. W. Spurr, city engineer, Guildhall.

COVENTRY.—September 21st.—For the construction of workmen's dwellings, for the corporation. — Mr. J. E. Swindlehurst, city engineer and surveyor.

ILFORD.—September 22nd.—For the erection of a sanatorium, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

LLANFYLLIN.—September 22nd.—For the erection of eight cottages, for the rural district council.—Mr. T. Edwards, clerk.

TEWKESBURY.—September 22nd.—For the erection of porter's lodge, engine-house, mortuary, and other buildings, for the Joint Hospital Board.—Mr. J. Villar, 5 Essex-place, Cheltenham.

OLDHAM.—September 22nd.—For the erection of firemen's dwellings, for the corporation.—Messrs. Winder & Taylor, architects, 61 Union-street, Oldham.

PORTSMOUTH. September 23rd. For the erection of two conveniences, for the corporation. Borough Engineer.

MANCHESTER.—September 23rd.—For the erection of a valve-house, for the Gas Committee.—Mr. F. A. Price, superintendent, Gas Department, Town Hall.

WREXHAM.—September 23rd.—For the erection of twenty-two houses and the construction of streets, for the rural district council.—Mr. J. Price Evans, engineer and surveyor.

CARDIGAN.—September 24th.—For the erection of a school for the County Education Committee.—Mr. G. Dickens-Lewis, county architect, Aberystwyth.

WORCESTER.—September 28th.—For the erection of a footbridge over Laughern Brook, for the corporation.—Mr. Thomas Caink, city engineer.

RUNCORN.—September 28th.—For the erection of a depot, for the urban district council.—Mr. J. Wilding, surveyor.

WHITEFIELD.—September 28th.—For alterations to public offices and the erection of fifty-eight houses, for the urban district council.—Mr. G. M. Denton, engineer and surveyor.

SOMERSET.—September 29th.—For rebuilding High Bridge, on the Taunton and Ilminster road, for the county council.—Mr. E. Stead, county surveyor, Wells.

CARDIFF.—September 29th.—For the erection of 144 workmen's dwellings, for the corporation.—Mr. W. Harpur, city engineer.

LONDON.—October 2nd.—For the construction of a service reservoir, for the Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

SHEFFIELD.—October 3rd.—For the execution of works in connection with the covering of the river Sheaf, consisting of bridge widening, new weir, new bridge, retaining wall, and new street, for the corporation.—City Engineer.

HEYWOOD.—October 5th.—For extensions to electricity works, for the corporation.—Mr. J. B. Nuttall, borough surveyor.

COLWYN BAY.—October 8th.—For the erection of a refuse destructor, with steam boiler and auxiliary machinery complete, for the urban district council.—Mr. E. M. Lacey, consulting engineer, 12 Victoria-street, Westminster, S.W.

WARRINGTON.—October 9th.—For the erection of a school, for the Education Committee.—Mr. J. M. Murray, secretary, Education Office.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the municipality of 200 tons of refuse per day, for the municipality. Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

ABERDEEN.—September 21st.—For the supply of [illegible] for the Harbour Commissioners. Mr. R. G. Nicol, harbour engineer.

PLYMOUTH.—September 21st.—For the supply and [illegible] of [illegible] for the corporation. Mr. [illegible], borough engineer and surveyor.

STAFFORD.—September 28th.—For the supply of cast-iron clock tower, for the corporation.—Mr. W. [illegible], borough engineer.

Roads.

STEVENAGE.—September 21st.—For the supply of 500 tons of clean chippings and dust, and broken Guernsey, Leicester, or other granite, for the urban district council.—Mr. W. O. Times, clerk.

HYLE.—September 21st.—For making up a street for the urban district council.—Mr. T. Bartram, surveyor.

ANDOVER.—September 22nd.—For kerbing and [illegible] works, for the corporation.—Mr. R. W. Knapp, borough surveyor.

ROMFORD.—September 22nd.—For works of road improvement, for the urban district council.—Mr. H. T. Ridge, surveyor.

WEST HAM.—September 22nd.—For making up Canning-road, for the corporation.—Borough Engineer.

RHONDDA.—September 22nd.—For making up certain streets, for the urban district council.—Mr. E. H. Barber, engineer and surveyor, Pentre.

ENFIELD.—September 23rd.—For making up Waverley-road, Crescent-road, and Old Park-road, for the urban district council.—The Surveyor.

CROYDON.—September 24th.—For making up a certain road, for the rural district council.—Mr. R. M. Chart, surveyor.

LAMBETH.—September 24th.—For the construction of road foundations, for the borough council.—Mr. Henry Edwards, borough engineer.

DORKING.—September 26th.—For works of kerbing, channelling, and metalling, for the urban district council.—Mr. W. A. Clegg, Council Offices.

RUNCORN.—September 28th.—For making up with tarred macadam certain streets and passages, for the rural district council.—Mr. R. Garnett, surveyor, Bold-street Chambers, Warrington.

WIGAN.—September 28th.—For paving work with granite setts, for the corporation.—Mr. A. T. Gooseman, borough engineer.

RUNCORN.—September 28th.—For the execution of private street works, for the rural district council.—Mr. R. Garnett, surveyor.

UXBRIDGE.—September 28th.—For steam rolling and scarifying, for the urban district council.—Mr. W. T. Harvey, clerk.

COWES.—September 29th.—For the supply of broken granite and other road material, for the urban district council.—Mr. J. W. Webster, engineer and surveyor.

BARNET.—September 29th.—For the construction of new roads on the housing estate, approximately 4,800 sq. yds., together with about 1,000 ft. run of sewers, for the urban district council.—The Surveyor.

GATESHEAD.—September 29th.—For paving work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

WOOD GREEN.—September 30th.—For the execution of private street works, for the urban district council.—The Surveyor.

CHISWICK.—September 30th.—For making up a street, for the urban district council.—Mr. E. Willis, surveyor.

TANGIER.—October 3rd.—For road construction, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

BARCELONA.—October 9th.—For street paving works, for the municipality.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

Sanitary.

HEMEL HEMPSTEAD.—September 21st.—For the [illegible] and [illegible] works, for the rural district council.—Mr. T. H. Lighbody, surveyor, 9 Market-square, Hemel Hempstead.

HARPENDEN.—September 22nd.—For the construction of about 1,400 ft. of 12-in. and 9-in. pipe sewers, for the urban district council.—Mr. John H. Leverton, surveyor, Public Hall, Harpenden.

WATFORD.—September 22nd.—For sewer extension, for the rural district council.—Mr. E. Lailey, engineer, 9 Market-street, Watford.

SEATON DELAVAL.—September 22nd.—For work of scavenging, for the urban district council.—The Surveyor.

CHESTERTON.—September 23rd.—For the supply of Sanitas non-poisonous disinfectants, for the rural district council.—Mr. J. F. Symonds, clerk, 9 Benet-street, Cambridge.

MACCLESFIELD.—September 23rd.—For the construction of a surface-water sewer, for the corporation.—Borough Surveyor.

STRATFORD-UPON-AVON.—September 28th.—For the construction of drainage, manholes and flushing works, for the corporation.—Mr. R. Dixon, borough surveyor.

HAVANT.—September 28th.—For removing, washing, and replacing 2,000 cub. yds. of filtering material in the filter-beds, for the urban district council.—Mr. A. E. Stallard, surveyor.

SALTASH.—October 1st.—For the removal of house refuse and road sweepings, for the corporation.—Borough Surveyor.

QUEENSTOWN.—October 2nd.—For the construction of an outfall sewer, for the urban district council.—The Clerk.

BANBURY.—October 3rd.—For the construction of about 1 mile of 18-in., 15-in., and 9-in. cast-iron and stoneware pipe sewers, with manholes, storm overflow chamber, erection of engine-house, refuse destructor-house, and other works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

WATH-UPON-DEARNE.—October 3rd.—For the alteration and reconstruction of the sewage disposal works, for the urban district council.—Mr. J. H. Drew, engineer.

MANCHESTER.—October 3rd.—For the supply of graded slag, stoneware pipes, best bends, stoneware covers, and stoneware underdrainage tiles, for the Rivers Committee.—Secretary, Town Hall.

BISHOP AUCKLAND.—October 5th.—For the supply of disinfectants, for the rural district council.—Dr. Penfold, medical officer of health, 9 Craddock-street, Bishop Auckland.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Miscellaneous.

ASHTON-UNDER-LYNE.—September 28th.—For the supply of 9,200 yds. of artificially prepared blast-furnace slag, for the corporation.—Mr. J. Rowbottom, engineer, Town Hall.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ASHBY-DE-LA-ZOUCH.—Accepted for laying pipe sewer with manholes, for the rural district council.—Mr. S. Turner, surveyor:—

G. E. Duncan, Melton Mowbray, £150.

BROMLEY.—For the erection of eight cottages at Knockholt, for the rural district council:—

F. P. Duthoit, Bromley	£2,318
F. C. Gorham, Whitelearfe	2,039
Taylor & Sons, Bromley	1,875
J. Howard, Orpington	1,824
W. P. Rook, Dunton Green	1,800

CHEADLE.—For the enlargement and extension of the sewage disposal works, for the rural district council.—Mr. F. T. Inskip, surveyor:—

J. Taylor & Son, Stoke-on-Trent	£240
J. Pattison, Stoke-on-Trent* ..	225

[illegible] works extension, for the [illegible] J. Allerslev, engineer and surveyor:—

CONTRACT No. 1.

[illegible]
W. Morley & Sons, Keighley 4,200
[illegible] 4,527
[illegible]
[illegible]
[illegible]

CONTRACT No. 2.

Sandix Engineering Company, Limited, Leeds [illegible]
[illegible]
[illegible] 620
[illegible] 692
[illegible]
[illegible]
[illegible]
[illegible] 4[illegible]
[illegible]
[illegible]
[illegible]
Stone & Co., Limited, London (not complete)
[illegible]

CONTRACT No. 3.

[illegible]
[illegible]
Crossley Brothers, Limited, Manchester .. [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
J. Westmeadow & Son, Rochdale 30[illegible]
Keighley Gas and Oil Engine Company, Keighley [illegible]

FARINGDON.—For supplying and laying about 900 yds. of [illegible] glazed stoneware socket sewer at Longworth, for the rural district council.—Mr. H. Glynn Warne, engineer:—

[illegible] Berks £[illegible]
J. Simms & Son, Oxford 365
A. Cox & Son, Abingdon [illegible]

HAVERFORDWEST.—For kerbing, channelling and paving works, for the corporation.—Mr. W. Bevan, borough surveyor:—

G. Griffiths & J. Morgan, Haverfordwest 1[illegible]
I. Farley, Stourbridge, Worcs. 95

Borough Surveyor's estimate, £140.

LEATHERHEAD.—For the supply of about 300 tons of tar-macadam of hard blast furnace slag of various sizes, for the urban district council.—Mr. Sidney E. Drake, surveyor:—

Northern Quarries, Limited, London £311
J. Oakes & Co., Alfreton Ironworks, Derbyshire 28[illegible]
Claridge's Patent Asphalte Company, Limited, London 28[illegible]
J. Wainwright & Co., Limited, Shepton Mallet 281
Constable, Hart & Co., London 279
Tarmac, Limited, Wolverhampton 271
W. Prestwich & Sons, Bromfield 260

WANTAGE.—Accepted for the erection of six workmen's dwellings, for the rural district council.—Mr. J. W. Harris, surveyor:—

J. P. Barrett, West Hanney, Wantage, £1,270.

WIGAN.—For the supply of tramway rails, for the corporation.—Mr. A. T. Gooseman, borough engineer:—

W. Scott, Limited, Leeds, £7 15s. per ton.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

SEPTEMBER.

19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.

OCTOBER.

3.—Institution of Municipal and County Engineers: East Midland District Meeting at Hinckley.

24.—Royal Sanitary Institute: Meeting at York. Discussion on "Biological Treatment of the York Sewage."

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

URBAN DISTRICT COUNCIL OF FLEET, HANTS.

APPOINTMENT OF CLERK OF WORKS.

The consideration of the appointment for the above has been deferred for the time being.

(By order)
W. H. WRIGHT,
Clerk to the Council.

Council Offices,
Fleet. (1,919)

BOROUGH OF ROYAL TUNBRIDGE WELLS

BOROUGH AND WATER ENGINEER'S DEPARTMENT

TEMPORARY ASSISTANT.

The Council are prepared to consider applications for the post of Temporary Assistant in the Borough and Water Engineer's Department. The person appointed must be a good Draughtsman and be thoroughly experienced in the use of the Dumpy Level, Theodolite, and other usual Surveying instruments, in the pegging out of Site Rails for Sewerage Works, taking of Levels, and setting out of Works; also the preparation of Estimates, and other work of a Borough Engineer's Office, and must have had good experience in a similar capacity under a public authority.

The appointment is rendered necessary by the enlistment of members of the Staff in His Majesty's Army in consequence of the present European War, and, subject to the services of the person appointed proving entirely satisfactory, will be for a period of not less than six months, with a possibility of extension should the permanent Staff not have returned to their duties at the end of that period.

Any further information, if desired, may be obtained on application to Mr. W. H. Maxwell, A.M.I.C.E., Borough and Water Engineer.

Salary will be at the rate of £3 (Three Pounds) per week, paid monthly.

Applications to be in Candidate's own handwriting, and to state age, past experience, and *earliest* date when duties can be commenced, to be accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than 10 a.m., Tuesday, 29th September, 1914.

W. C. CRIPPS,
Town Clerk.

Town Hall,
Tunbridge Wells.
September 14, 1914. (1,924)

HAMPTON URBAN DISTRICT COUNCIL.

ROAD FOREMAN.

The above Council require a Road and General Foreman in the Highways Department.

Applicants must be suitable and competent men, and thoroughly qualified both in the construction and maintenance of roads and sewers, and experienced in the management of men and team labour, &c.

Wages £2 5s. per week, with 2s. 6d. allowance for bicycle.

Applications, in candidate's own handwriting, stating age, qualifications, &c., and accompanied by copies of not more than three recent testimonials, endorsed "General Foreman," to be sent to the undersigned not later than 5 p.m. on Thursday, the 1st day of October, 1914.

(By order)
SIDNEY H. CHAMBERS,
Surveyor.

Surveyor's Office,
Public Offices,
Hampton, Middlesex.
September 16, 1914. (1,929)

PORTSLADE-BY-SEA URBAN DISTRICT COUNCIL.

SURFACE-WATER SEWERAGE WORKS.

CLERK OF WORKS REQUIRED.

The above Council propose to appoint a Clerk of Works at a salary of £2 10s. to £3 per week, according to qualifications, to superintend under the Engineer and the Resident Engineer the carrying out of the above works, and invite applications from persons who have had experience in similar work.

Applications, sealed and endorsed "Clerk of Works," must be accompanied by not more than three recent testimonials (copies), and should reach me not later than 29th September, 1914.

Canvassing, direct or indirect, will disqualify.

Dated this 18th day of September, 1914.

ERNEST H. KEMPE.

Council Offices,
Portslade-by-Sea. (1,920)

EAST SUFFOLK COUNTY COUNCIL

MAIN ROADS

APPOINTMENT OF DIVISIONAL SURVEYOR.

Applications are invited for the appointment of Divisional Surveyor to take charge under the County Road Surveyor of a district of Main Roads in the County.

Applicants must be not more than 35 years of age, and must be prepared to devote their whole time to the duties of the office, and to commence such duties as early as possible.

Salary £150 per annum, rising by annual increments of £10 to £180 per annum, with an allowance of £20 for the purchase and upkeep of a motor cycle, such salary and allowance to include all travelling and other expenses, except travelling out of District on County business when instructed by County Road Surveyor, Postages, Telegrams and Stationery.

Applications, in candidate's own handwriting, endorsed "Divisional Surveyor," and accompanied by copies of not more than three recent testimonials, must be sent to the undersigned not later than the 26th September, 1914.

Personal canvassing will disqualify.

Forms of application and particulars of the duties and terms of the engagement may be had on application to

W. JERVIS,
County Road Surveyor.

County Hall, Ipswich.
September 15, 1914. (1,927)

EAST SUFFOLK COUNTY COUNCIL.

MAIN ROADS

GENERAL ASSISTANT.

Applications are invited for the appointment of a General Assistant in the County Road Surveyor's Office for the period of the war.

Candidates must possess a sound, practical knowledge of surveying and levelling, and must be quick and accurate with figures.

Commencing salary at the rate of £90 per annum, rising, on approved service, by annual increments of £10, to £120 per annum.

Applications, in candidate's own handwriting, stating age, experience, and enclosing copies of three recent testimonials, and endorsed "General Assistant," to be sent to County Road Surveyor, County Hall, Ipswich, on or before 10 a.m. of the 26th September, 1914.

Duties to commence as soon as possible.

W. JERVIS,
County Road Surveyor.

County Hall, Ipswich.
September 15, 1914. (1,926)

BRIDGWATER RURAL DISTRICT COUNCIL.

ASSISTANT SURVEYOR.

Applications are invited for the appointment of General Assistant in the Surveyor's Department to take the place, temporarily, of one who has joined Lord Kitchener's Force.

Candidates must have received a thorough training in a municipal surveyor's office, and be competent to make surveys and superintend the construction and maintenance of roads, bridges, &c.

Salary £85 per annum, such sum to include the upkeep of a cycle.

Applications, in candidate's own handwriting, stating age, training, qualifications, present and past experience, accompanied by copies of three recent testimonials, to be received by me not later than Saturday, September 26th, 1914.

W. ALEX. COLLINS,
Surveyor.

Bridgwater.
September 10, 1914. (1,908)

ENGINEER AND SURVEYOR to a large Urban District near Manchester has vacancy for articled pupil.—Write Box 1,461, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,892)

ARTICLED PUPIL required. Works include Pavilion, Baths, Drainage Scheme, &c., £100,000. —Apply J. Stanley Sawdon, A.M.I.C.E., Council Offices, St. Anne's-on-the-Sea, Lancs. (1,916)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but it is responsible for their despatch so as to enable it to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to enable their inclusion in the next issue of* THE SURVEYOR. *Such advertisements may, in case of emergency, only, be telephoned (City No. 1046) subject to later confirmation by letter.*

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL.

REFUSE DESTRUCTOR.

The above Council are prepared to receive Tenders from experienced firms for the erection of a Refuse Destructor, with Steam Boiler, Auxiliary Machinery, &c., complete.

Copies of the General Conditions, Specification, Form of Tender and Plans, may be obtained from the Consulting Engineer, Mr. E. M. Lacey, M.INST.C.E., 12 Victoria-street, Westminster, S.W., on payment of a deposit of five guineas, which will be refunded on receipt of a *bonâ-fide* Tender. Duplicate copies can be obtained on payment of one guinea, which will not be returned. Any further particulars may be obtained from Mr. William Jones, ASSOC.M.INST.C.E., the Council's Engineer and Surveyor, Council Offices, Colwyn Bay.

Tenders must be in the form attached to the Specification, and must be delivered to me not later than 11 o'clock in the forenoon on Thursday, the 8th day of October, 1914, in sealed envelopes, endorsed "Tender for Refuse Destructor."

The Council do not bind themselves to accept the lowest or any of the Tenders sent in.

JAMES AMPHLETT,
Clerk to the Council.

Council Offices,
Colwyn Bay.
September 2, 1914. (1,896)

BOROUGH OF ASHTON-UNDER-LYNE.

SEWAGE DISPOSAL WORKS RECONSTRUCTION.

CONTRACT NO. 6.

The Corporation are prepared to receive Tenders for approximately 9,200 cub. yds. of artificially prepared Blast-furnace Slag.

Specification and all particulars can be obtained from the Engineer, Mr. J. Rowbottom, Town Hall, Ashton-under-Lyne.

Tenders, in official envelopes, to be delivered to the undersigned not later than first post on September 28th, 1914.

The lowest or any Tender will not necessarily be accepted.

JOHN NEAL,
Borough Comptroller.

Town Hall,
Ashton-under-Lyne.
September 14, 1914. (1,921)

WATH-UPON-DEARNE URBAN DISTRICT COUNCIL.

The above Council is prepared to receive Tenders for the alteration and reconstruction of the Sewage Disposal Works at Common-lane, Wath-upon-Dearne.

The plans may be inspected, and a copy of the Specification, Bill of Quantities and Form of Tender obtained, on application to Mr. J. H. Drew, M.INST.M. AND CY.E., Engineer to the Council, Town Hall, Wath-upon-Dearne, on and after September 22, 1914, between the hours of 10 a.m. and 1 p.m. (except Saturdays), on payment of the sum of Five Guineas, which will only be returned upon the receipt of a *bonâ-fide* Tender, and the return of all documents.

Sealed Tenders, upon the form supplied, properly filled in and endorsed "Tender for Sewage Works," must be delivered to the undersigned not later than noon on Saturday, the 3rd day of October, 1914.

The Council does not bind itself to accept the lowest or any Tender.

NICHOLSON & CO., Solicitors,
Clerks to the Council.

28 High-street, Wath-upon-Dearne.
September 19, 1914. (1,928)

METROPOLITAN BOROUGH OF SHOREDITCH

WROUGHT-IRON UNCLIMBABLE FENCING, &c.

The Council of the Metropolitan Borough of Shoreditch invite Tenders for the supply and erection of Wrought-iron Unclimbable Fencing, with all necessary [illegible] complete.

The Drawings, Specification and Form of Tender may be obtained from Mr. T. L. Hughes, Borough Surveyor, at the Town Hall, Old-street, E.C., upon a deposit of [illegible] which sum is returnable on the receipt of a bona-fide Tender, after same has received the consideration of the Council. Tenders, on the Form only, sealed and endorsed "Ironfencing Railing," to be handed in not later than 10 a.m., Thursday, 24th September, 1914.

Trade Union rates of wages and hours must be observed, and no sub-letting is allowed. The Council does not bind itself to accept the lowest or any Tender.

(By order)

J. A. D. MILNE,
Town Clerk.

September, 1914. (1,923)

SOMERSET COUNTY COUNCIL.

The County Works Committee are prepared to receive Tenders for the rebuilding of High Bridge, on the Taunton and Ilminster road at Cogland, about 1½ miles from Hatch Station.

The work comprises taking down the existing bridge, the provision of a temporary bridge, the building of a new bridge, 7-ft. 6-in. span, in reinforced concrete and masonry, and roadworks.

The Drawings, Specification, Form of Contract and Bond may be seen, and Bills of Quantities obtained, at the County Surveyor's Office, Wells, on and after the 17th September, on payment of Two Guineas, which sum will be refunded to the Tenderer upon receipt of a *bona-fide* Tender and the return of the documents which have been supplied to him.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "High Bridge," must be delivered to the undersigned not later than 5 p.m. on Tuesday, the 29th September, 1914.

EDWARD STEAD, ASSOC.M.INST.C.E.,
County Surveyor.

Wells.
September 15, 1914. (1,925)

CITY OF WORCESTER.

TENDERS FOR FOOTBRIDGE.

The Corporation of Worcester invite Tenders for the erection of a Footbridge over Laughern Brook.

Plans and Specification may be seen, and copies of Form of Tender obtained, at the City Engineer's Office, Guildhall, Worcester.

Sealed Tenders, upon the prescribed form, endorsed "Tender for Footbridge," to be sent in not later than 10 a.m. on Monday, the 28th September, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

THOMAS CAINK,
City Engineer.

Guildhall, Worcester.
September 15, 1914. (1,930)

BARNET URBAN DISTRICT COUNCIL.

TO ROAD CONTRACTORS AND OTHERS.

The Council invite Tenders for the construction of new roads on their Housing Estate, approximately 4,800 sq. yds., together with about 1,000-ft. run of sewers.

Plans and Specification can be seen at the Surveyor's Office, No. 40 High-street, Barnet, and all information obtained from the Architect on application by letter.

Tenders, on official forms only, and endorsed "Tenders for Roads Housing Estate," must be addressed to me, and delivered at the Council's Offices, No. 40 High-street, Barnet, not later than noon on Tuesday, 29th September, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. W. POOLE,
Clerk of the Council.

September 14, 1914. (1,931)

CITY OF SHEFFIELD.

TO CONTRACTORS AND BUILDERS.

The Improvement Committee of the City Council are prepared to receive Tenders for the execution of works in connection with the Covering of River Sheaf, in the City of Sheffield, and consisting of the following:

Bridge Widening, Exchange-street.
Covering of River Sheaf in Reinforced Concrete.
New Weir across River.
New Bridge and Retaining Wall, Newsome-street.

Particulars and Forms of Tender, together with "Conditions of Contract," may be obtained, and Drawings inspected, at the Office of the City Engineer, Town Hall, Sheffield, on and after Monday, September 21st, on payment of the sum of £1, which will be returned on receipt of a *bona-fide* Tender. Applications to be endorsed "Covering of River Sheaf."

Tenders, enclosed in official envelope provided, to be delivered at the City Engineer's Office not later than 10 o'clock a.m. on Saturday, October 3rd, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

Any person or firm sending in a Tender will be required to add a Schedule to such Tender, stating the names of the various classes of labour which he or they intends or intend to employ, together with the places where such labour will be employed, and the rates of wages, hours of labour, and conditions of employment to be paid and observed in respect to each class of labour, all of which, as shown in such Schedule, shall comply with the City Council's form of clauses respecting wages, hours, and conditions of labour, and prohibition against assigning or sub-letting, a copy of which will appear in the "Conditions of Contract."

(By order)

WILLIAM E. HART,
Town Clerk.

Town Hall,
Sheffield.
September 14, 1914. (1,922)

URBAN DISTRICT COUNCIL OF ENFIELD.

TO CONTRACTORS.

The Council invite Tenders for Making Up the following Private Streets in their Districts—viz.:—

Waverley-road, Enfield.
Crescent-road, Enfield.
Old Park-road, Enfield.

Plans and Specifications can be seen, Forms of Tender, and all information obtained, on application to Mr. Richard Collins, the Council's Surveyor, at these Offices, any day (except Saturday) between the hours of 9 a.m. and 5 p.m.

The Contractor will be required to observe Trade Union hours of labour and to pay wages according to the published scale of the London County Council for the time being in force.

Separate Tenders for each Road (on the Form supplied only) to be sent in to me not later than noon on Wednesday, the 23rd day of September instant, endorsed "Tender for ——."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,
Clerk.

Public Offices,
Enfield, Middlesex.
September 10, 1914. (1,918)

EXAMINATIONS.

CITY OF LONDON COLLEGE,

White-street and Ropemaker-street,
Moorfields, E.C.

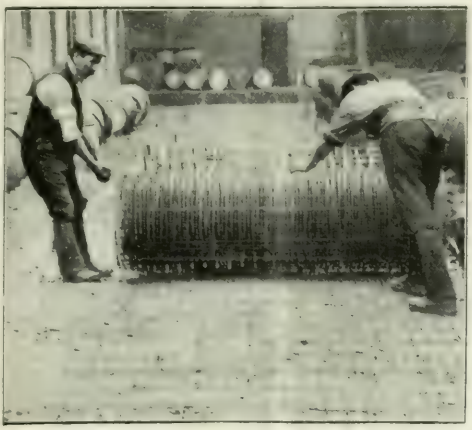
Michaelmas Term Commences September 28th.

COURSES in preparation for the SURVEYORS' INSTITUTION EXAMINATIONS.

Courses are also arranged for the Examination of the Auctioneers' Institute. Full particulars on application to

DAVID SAVAGE,
Secretary.

(1,873)



To strengthen this Road-bed

B.R.C. Road-Bed Reinforcement is being laid between the two thicknesses of concrete.

B. R.C. ROAD-BED REINFORCEMENT

Consists of a high-grade steel wire mesh, the transverse wires of which are securely welded to the horizontal wires by a patent electrical process.

The material is made in rolls 6 ft. wide and to any length required. It is easy to unroll or otherwise handle, and requires no expert labour to instal. By reason of its continuity of construction no portion of the reinforcement can, by any chance, be omitted or misplaced or accidently disturbed

A road-bed laid with 6 in. of concrete and reinforced with B.R.C. Mesh is stronger than a 12 in. unreinforced road.

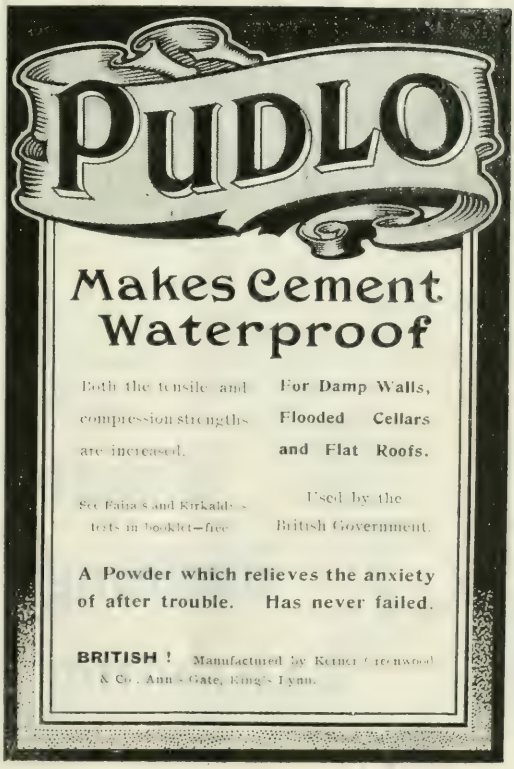
A B.R.C. Mesh reinforced road lasts longer, costs less to maintain, takes less time to construct, and needs much less supervision during construction.

Full particulars from

THE BRITISH REINFORCED CONCRETE ENGINEERING Co. Ld.

82 Victoria Street, Westminster, London, S.W

C.W.H



THE SURVEYORS' INSTITUTION
(Incorporated by Royal Charter)
12 Great George-street, Westminster, S.W.

EXAMINATIONS, 1915.

PRELIMINARY EXAMINATION.

Notice is given that the Preliminary Examination [illegible] will be held on the 13th [illegible] 1915 [illegible] next.

[illegible] the counties of Lancashire, Cheshire, Yorkshire, Durham, Cumberland, Westmorland, Northumberland, Staffordshire, and North Wales will be examined at Manchester. Candidates from other counties in England and Wales will be examined in London.

[illegible] will be examined in Dublin.

Scottish Candidates in Glasgow.

PROFESSIONAL EXAMINATIONS.

Notice is also given that the Annual Professional Examinations for Land Agents, Valuers, Building and Quantity Surveyors (held under the provisions of the Charter) will be held on the 22nd to 26th of March next inclusive.

MINING SURVEYORS' EXAMINATION.

The newly instituted Examinations for Mining Surveyors will be held at the same time.

All English Candidates for the Professional Examinations are examined in London.

Irish Candidates in Dublin.

Scottish Candidates in Glasgow.

All applications for both the Preliminary and the Professional Examinations must be sent in before the end of September. The necessary Entry Forms for the various Examinations, and particulars as to subjects, course of examination, prizes and scholarships can be obtained of the Secretary. (1,897)

PLEASE MENTION "THE SURVEYOR" WHEN REPLYING TO ADVERTISEMENTS.

PREPARATION FOR EXAMINATIONS.

SURVEYORS' INSTITUTION EXAMINATIONS.

Complete COURSES OF PREPARATION for these EXAMINATIONS are conducted by Messrs.

PARRY, BLAKE & PARRY & B. W. ADKIN,

who have successfully prepared over 3,000 candidates and 108 prizewinners, including 12 Gold Medallists, 15 Silver Medallists, 18 Institution Prizemen, &c.

The Courses are given either in Evening Classes, by Correspondence, or in Office (study during the daytime at 82 Victoria-street, with personal help).

The 6 and 18 Months' Courses for the Examinations of March, 1915 and 1916 respectively, will be commencing early in September.

Messrs. Parry, Blake & Parry also conduct Courses of Preparation, with the highest success, for the Examinations of THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS, &c.

The teaching is done personally by the members of the firm, namely:

Mr. RICHARD PARRY, F.S.I., A.M.I.C.E., B.SC.(LOND.), Barrister-at-Law.

Mr. E. H. BLAKE, F.S.I. (with Special Sanitary Science Diploma), Gold Medallist, S.I., 1911, F.I.SAN.E., M.R.SAN.I., and Diploma of the Institution of Municipal and County Engineers.

Mr. A. E. PARRY, F.S.I., and

Mr. B. W. ADKIN, F.S.I., F.R.S., M.R.A.S.E., Silver Medallist R.S.A.S., Barrister-at-Law.

A Staff of fully qualified Assistants is also engaged.

For full particulars of these Courses, or for any advice with respect to the Examinations, please apply to

Messrs. PARRY, BLAKE & PARRY,

Tele., Victoria 6680. 82 Victoria-street, Westminster.

Municipal Engineers' Section

April 13th to 24th, 1915.

EXHIBITION

:: In connection :: with the

Great Building Exhibition

MEXPHALTE

Special Prices during the War

We have arranged to quote specially low prices for Mexphalte, the ideal Mexican Bitumen, to all PUBLIC AUTHORITIES executing road work during the War.

Grouting with Mexphalte is simplicity itself, and can be carried out by unskilled labour.

Write for particulars:

ANGLO-MEXICAN Petroleum Products Co., Ltd.,

FINSBURY COURT, LONDON, E.C.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. SEPTEMBER 25, 1914. No. 1,184.

Minutes of Proceedings.

The Cleethorpes Meeting.

The enormous increase in the population of Cleethorpes which has taken place in recent years has naturally had a material effect upon the activities of the district council. The figures given by Mr. Charles Waithman, ASSOC.M. INST.C.E., the surveyor to the council, in the paper which he read at last Saturday's meeting of the Institution of Municipal and County Engineers, show that the population has practically doubled since 1911. This increase is due partly to the development of the steam trawler industry, and partly to the growing popularity of the town as a holiday resort. It is not surprising therefore that the works described in Mr. Waithman's paper were of a varied and interesting character, although he did not deal with the new sewerage scheme and outfall works, which were the subject of a separate paper by Mr. John S. Alford, M.INST.C.E. Having referred to various aspects of highway administration and maintenance, Mr. Waithman passed to the subject of building by-laws. These are at present under revision, as a result of which it is hoped to secure, among other things, more satisfactory control over the erection of sheds and temporary buildings. It is mentioned incidentally in the paper that Mr. Waithman is engaged upon the preliminary details of a town planning scheme, the scheduled area comprising approximately 10,000 acres, and embracing parts of the County Borough of Grimsby and the Grimsby Rural District Council. The main interest in this announcement lies in the fact that the whole area of the urban district is but 1,184 acres, or rather more than one-ninth of the area which it is proposed to include in the scheme. While we do not wish to say anything to discourage a local authority which has always been alive to the best interests of its district, it will be interesting to see what view the Local Government Board will take of this rather ambitious project. In dealing with refuse destructors, Mr. Waithman pointed out that his original scheme provided for a three-cell back-fed destructor, capable of a one-cell extension. On the loan inquiry, however, the Local Government Board asked for the construction of two separate sets of furnaces, with provision for a one-cell extension to each, an increase in the height of the chimney shaft from 100 ft. to 125 ft., and the construction of the inclined roadway in either brickwork or concrete. A scheme embodying these requirements was ultimately undertaken, and those present at the meeting were able to inspect the work at a very interesting stage, with one two-cell unit completed and the other in course of construction.

Turning now to Mr. Alford's paper, which consisted in the main of a lucid description of the works designed and constructed under the direction of his firm, considerations of space necessitate our confining ourselves to two points for comment. The first is in regard to the storage tank. The original design was for a reinforced concrete tank on reinforced concrete piles. The estimated cost in round figures was £10,000. The Local Government Board sanctioned the design and gave ten years for the repayment of the loan. The author re-designed the tank, however, using mass concrete and timber piles. The estimated cost was £13,750, for which the board indicated their intention to give twenty-five years for repayment. The effect of this comparatively short period for repayment in the case of a reinforced concrete structure was that, whereas the annual loan charges for the more expensive mass concrete tank were £880, those for the reinforced concrete tank were £1,233. In these circumstances the mass concrete design was adopted. While fully realising the difficulty of establishing a proper balance between the life of works and the immediate requirements of the purchaser, we fully agree with Mr. Alford's conclusion that there is need of co-ordination between the practice of the Committees of Parliament and the Local Government Board in respect to loan periods for constructional works. Parliamentary Committees, in deciding on the term for repayment, do not always take detailed evidence of the durability of the works to be constructed. The board make a detailed investigation. The results are often widely different in the two cases. For instance, in a recent case, a local authority having obtained by an Act a very long repayment period, proceeded to construct a substantial portion of the works by methods which, if under the purview of the Local Government Board, would have resulted in a ten years' period being fixed. The other matter to which we desire to refer arises from the fact that the greater part of these works were executed by direct labour. The consequence of this was that, in order to comply with the requirements of the Public Health Act, every important unit of plant or machinery had to be

publicly advertised for, with the result that the engineer recommended to adopt the lowest tender should not be accepted. This is a point which should be borne in mind when the Public Health Acts are revised, when it should be made lawful to let work of this special character by limited tender.

* * *

The Hinckley Meeting.

The meeting of the East Midland District of the Institution of Municipal and County Engineers which is to be held at Hinckley to-morrow week promises to be of considerable interest. We understand that formal invitations have been sent only to members in the district, but it is hoped that many others from adjoining districts will make an effort to be present. As will be seen from the programme, which we print elsewhere in this issue, two papers will be submitted for discussion. The first of these, by Mr. E. H. Crump, the engineer and surveyor to the council, is entitled "Eleven Years' Municipal Work at Hinckley," a title which is self-explanatory. The second paper will, however, be of a more general character, the author, Mr. W. H. Court, of the borough engineer's department, Leicester, having selected as his subject "By-Laws and the Housing Question." The detrimental effect of a rigid code of by-laws on the economy of any housing scheme is among the more interesting questions which come within the scope of Mr. Court's subject, which should produce an interesting and profitable discussion. The afternoon will be devoted to a round of visits, which will include an inspection of workmen's dwellings erected and in course of erection, and the Snarestone waterworks. Finally, by permission of Earl Howe, the members will have an opportunity of inspecting the gardens of Gopsall Park. Luncheon, it may be pointed out, will be provided by the chairman and members of the district council; therefore those members who are desirous of attending the meeting should send in their names to Mr. Crump not later than to-morrow, in order that the necessary arrangements may be made for their accommodation and entertainment.

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Town Planning Large Areas.

Among the papers read at the Cheltenham conference of the Institution of Municipal and County Engineers was one which was the result of a happy collaboration between the borough surveyor and town clerk of Sutton Coldfield. The experience of that borough in regard to town planning has been an interesting one. The council were from the first fully alive to the beneficial nature of the powers conferred upon them by the Act of 1909, and at once began to consider to what area under their control the provisions of the Act could with advantage be applied. Many proposals were made, and as the outcome of their consideration an area of 400 or 500 acres which were actually in course of development was selected. Subsequently, however, this area was enlarged to include lands which were considered likely to be developed within the next thirty or forty years, and a further extension took place in consequence of a request made by the owners at the statutory meeting. Practical experience of the difficulties and delays caused in dealing with so large an area has enabled the authors of this paper to make many useful suggestions. Among the more important matters of which they speak is the relationship between town planning and by-laws. The cry for the relaxation of the strict requirements of by-laws in certain cases is one which is deserving of much sympathy, but at the same time the cases for relaxation should be selected with great discretion. In these days it is apt to be forgotten that building by-laws are framed for the purpose of securing public control of all kinds of building and road making, and this main object must be kept well in view in discussing the limits within which relaxation may wisely be permitted. The existing model by-laws may be considered as embodying the minimum requirements for obtaining a proper standard of building, and it is therefore difficult to justify any general relaxation. A good deal may be said, however, in favour of embodying in a town planning scheme some discretionary power by which the local authority would be enabled to deal with special cases on their merits. Another important matter discussed in the paper is the limitation of the number of houses to be erected per acre. Mr. Clarry, the borough surveyor, speaks from experience when he says that, although this may appear at first sight to be an easy matter, practical contact with the task shows it to be more difficult. He expresses the view that the only reasonable way in which to proceed is to limit the larger owners to an average number of houses to the acre, extending over the whole of their land, with a maximum number for any one acre, so as to allow as much variation as possible in laying out the houses on their estates; and then to restrict the smaller landowners to a fixed number on their land to conform with the average number on the large estates. In referring to the amended Procedure Regulations, the town clerk observes that they have resulted in the disappearance of much unnecessary work. This comment is satisfactory as coming from one who was among the earliest critics of the original regulations. Some extracts from this interesting paper will be found in another column.

* * *

A Water Supply Dispute.

Many and various questions have arisen in connection with the subject of water supply. These have in the majority of cases been concerned with the interpretation of the expression "domestic purposes," as used in the Waterworks Clauses Act, 1847, or with some other clause or provision either in that statute or in some special Act. The dispute in *Hadham Rural District Council v. Challen* (noted at page 92 *ante*) was of a more unusual character, and involved the interpretation not of an Act of Parliament, but of a covenant in a deed. The council, as the water authority for their district, purchased by agreement certain farm lands for the purpose of constructing a reservoir, and it was part of the terms of the purchase that the council should (1) lay down pipes for a reasonable supply of water to the farm-house; (2) lay down pipes and erect a stand-pipe for a reasonable supply to the farm buildings; and (3) supply a reasonable quantity of water for the use of the house and buildings free of charge. At the date of this arrangement the farmhouse comprised about seven rooms, with kitchen, scullery, and so forth. Some time afterwards, however, it was sold, and the purchaser enlarged it by the addition of about a dozen rooms, part of the farm buildings being turned into a motor garage and the remainder being let to a non-resident farmer. In these altered circumstances the question arose whether the council were still bound by their agreement to continue a free supply to premises so entirely transformed in character and occupation from what they were when the agreement was made. The council contended that the character of the property had been so completely altered as to destroy its identity, and to relieve them from any obligation to supply water gratis to the house; and that in any event they were not bound to furnish a free supply to the farm buildings for

the purpose of washing motor cars. This, in substance, was the view taken by Mr. Justice Neville. He held that the covenant only bound the council to give a free supply to the house and buildings as they existed at the date of the agreement, and therefore that as regards the house the obligation was entirely at an end. With respect to the buildings, however, inasmuch as they remained substantially unaltered the obligation was still subsisting, but the water must not be used for the washing of motor cars housed in the garage.

* * *

Councillor as Surveyor.

The methods of certain local authorities in making appointments to public offices afford an interesting, if rather depressing, study, and the frequency with which complaints arise does not tend to diminish. It seems a fortnight ago that we drew attention to the appointment of a whole-time officer as "inspector of nuisances and surveyor, &c., at a commencing salary of £80 a year." That case was typical of many in which the services of men possessing technical skill are sought at what can hardly be described as a living wage. An example of another large class of cases which give rise to legitimate complaints is afforded by the method recently adopted by the Fowey Town Council in appointing a borough surveyor. When this appointment became vacant it was duly advertised, and ultimately three candidates were interviewed by the council. Of these, one hailed from St. Ives, another was the assistant surveyor at Newquay; while the third was Mr. W. T. H. Northcote, a member of the council. Can our readers guess who was appointed? We cannot undertake to offer any prizes, as we are confident that in any such guessing contest every competitor would be correct. Of course, Mr. Northcote was the successful candidate, receiving the votes of all his colleagues save one. Of his qualifications we know nothing, and so we are unable to comment upon that aspect of the case. Apart from that, however, two points remain for criticism—namely, the impropriety of a public body conferring an office of profit upon one of its own members, and the lack of consideration to others in inviting applications if it is intended to pursue such a course. Regarding the first matter, we believe that it is not unusual for the standing orders of a municipal corporation to provide that no person shall be allowed to be a candidate for any office of profit under the council until at least six months after he shall have ceased to be a member. It would be well if some regulation of this kind were to be added to the standing orders at Fowey.

* * *

The Northampton Institute.

Convinced as we are of the value to many of our younger readers of the courses of technical instruction provided by the several polytechnic and other kindred institutions, we have on many occasions urged their attention to announcements of classes in subjects which are likely to be of interest to them. We have before us a copy of the syllabus of the Northampton Polytechnic Institute, which is situated in St. John-street, E.C., thus being available for those resident in or near the Metropolis. This institute was originally founded as a branch of the old City Polytechnic, which also comprised the Birkbeck Institute and the City of London College. Since the dissolution of the City Polytechnic, however, the Northampton Institute has carried on a separate existence, its work being confined to the provision of classes in technological and trade subjects. The syllabus for the approaching session includes courses in civil, mechanical, and electrical engineering, the avowed object of the instruction being not so much to prepare the student to pass examination tests as to fit him to become a competent worker and thinker in the career which he has chosen. In each department the work consists of lectures, exercise classes, laboratory work, drawing office and workshop practice. The question of the position in which the last mentioned should be placed in the training of engineers is one which has been very much discussed by both the practising engineers and those responsible for their education. It is on all hands admitted that the trade workshop training can only be given in a commercial workshop, but that valuable introduction to such training can be given in the educational workshop. In the day courses in civil and mechanical and electrical engineering, therefore, the work has been arranged so as to allow of some interlacing of the commercial and educational training.

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A Phillack Councillor and the Surveyor's Grant.

The kind of indignity which municipal officials have to face occasionally was illustrated at a recent meeting of the Phillack (Cornwall) Urban District Council, when a member, Mr. S. James, called attention to a grant voted by the council to the surveyor, Mr. L. W. Chinn. In order that nothing may be lost to our readers of the delicious and delicate taste displayed by the councillor we venture to quote the incident in its entirety from the *Cornish Post*.

Mr. S. James said he had heard great dissatisfaction expressed among the public that Mr. Chinn, the surveyor, had accepted the remaining £10 which had been voted to him for work done in connection with the installation of the water supply. If Mr. Chinn did not refund the £10 although he had been voted that sum by the council he would move that they advertise for a new surveyor.

Mr. Chinn said he would not think of refunding the money.

Mr. James: Then it will be my duty to move a resolution that we advertise for a new surveyor.

The Chairman: You will have to give notice of such a resolution.

Mr. James: I will give notice.

In order apparently that there might be no mistake about the propriety of Mr. Chinn accepting the £10, it will be noticed that Mr. James himself emphasises the position of the council towards its officer by repeating the assertion that the money had been duly voted to the surveyor. In the circumstances, instead of wasting time by discussing the foolish motion of Mr. James it would be more appropriate if the Phillack Urban District Council considered the expediency and desirability of advertising for a new councillor.

* * *

Separation Allowances.

The Maldens and Coombe Urban District Council can scarcely be congratulated on the course they adopted at their last meeting as to their married employees who serve with the colours. As we understand it, one man who left first did so with the knowledge that he would be paid his full wages while serving. Since then nine others have been called up, and it was suggested that they be paid their wages less the army separation allowance of 11s. 1d. per week to the wife. In reply to a question, Mr. R. H. Jeffes, the surveyor, said he thought the arrangement with the first man had undoubtedly influenced those who had since left. It obviously would; but in spite of this the council decided to adopt the suggestion to reduce wages by the amount of the separation allowance. We cannot think the decision was either worthy or patriotic, and in view of the paltry amount involved it may be hoped they will see their way to revise it.

Town Planning Large Areas.*

PART I.—By W. A. H. CLARRY [illegible] Borough Surveyor, Sutton Coldfield.
PART II.—By R. A. REAY NADIN, Town Clerk, Sutton Coldfield.

PART I.

[illegible] Housing and Town Planning [illegible] Lines. They therefore recommend that every local authority should [illegible] planning scheme

MR. W. A. H. CLARRY, ASSOC. M.I.C.E.

in respect of the whole of their unbuilt area. The preliminary scheme should impose only a few regulations such as (1) the fixing of the maximum number of dwellings per acre; (2) the fixing of building lines to all existing roads; (3) such modifications of the building lines as may facilitate the scheme; (4) the securing of routes for any new thoroughfare forming [illegible]

This is exactly what the Act should have provided. All boroughs, urban districts, and probably many rural districts, if not required compulsorily to prepare a preliminary planning scheme, should be in a position to schedule the whole of its undeveloped area under a town plan by resolution of the council submitting the plan of the area and resolution for approval by the Local Government Board without a formal public inquiry or the service of notices on owners, lessees, and occupiers beyond an advertisement in the Local Press, so that a large amount of the preliminary work and expense, which the existing regulations entail, would be saved.

When the approval of the Local Government Board has been obtained, the district thus protected could be divided into smaller areas as and when they are developed, and the procedure under the regulations could then be taken.

The Town Planning Act of 1909, and the regulations issued by the Local Government Board under that Act, require so much detail, both as regards the information to be supplied and shown upon the many maps, that it has always appeared that it was never framed for very large areas, and yet, if the Act is to be of any practical utility, it must be for towns and districts comprising large areas of undeveloped land, as so little could be done with areas already built upon.

Take, for instance, the borough of Sutton Coldfield, which has an area of 13,030 acres, comprising land already laid out in streets and buildings, and may be considered fully developed, other land in the various stages of development, and a very large area of agricultural land. Directly the Town Planning Act [illegible] the council decided that the borough [illegible] the protection and the power [illegible] development a the Act conferred, and at once began to consider the vexed question of area. [illegible] was made, and an area of 400 or 500 acres, on which building operations were in active [illegible] was selected, this being also an area upon which a scheme, to comply with the Act and regulations, could [illegible] be prepared with every [illegible] regard to detail, and without undue expense to the authority.

It became quite evident, however, that there were many other parts of the borough where building was actually taking place, and so the area was enlarged to include land which was at that time considered likely to be developed, say, in the next thirty or forty years. Strange to say, the area was again enlarged at the request of the owners at the statutory meeting.

The very reasons which the owners advanced for extending the area confirm the suggestion of at once making the whole borough or district the area without so many elaborate details and plans. Their contention that the very people you would desire to [illegible] might purchase and outside the area of the scheme, just over the hard-and-fast line, and develop the same in such a manner as to be detrimental to the protected land, is a perfectly sound one, and even now there is not the slightest reason why they should not step over the extended boundary and do so.

Now that this large area has been adopted, a scheme covering every ownership must be prepared so as to govern its separate and joint development almost in detail; whereas it could much more satisfactorily, and with a far greater degree of success, be carried out in units of one or more ownerships when and as the various estates were proposed to be opened out for building purposes.

First of all, the owners must be interviewed separately, and the principal restrictions for the scheme submitted to them. It is useless approaching several owners together, even if their estates adjoin, as each one appears only sufficiently interested in his own land to discuss the questions fully and carefully with any possibility of agreement, and when there are nearly 600 owners to consult the diversity of opinion expressed as to what is necessary to be included in the scheme makes it almost hopeless to obtain a general agreement.

By far the most awkward owner to deal with is the one who possesses a large estate round or near his residence, and who has not the slightest intention of developing any portion of it, and has not the remotest interest in the number of houses per acre, the widths of roads, or whether shops or factories are built, &c. &c., but whose only wish is to be left alone, and to whatever suggestions you make replies, "You ought to submit them to my successor when he is ready to develop the estate"—whenever that may be. It therefore seems impossible when dealing with a large area to make anything but general restrictions governing adjoining estates, and leave the owners to lay out their land in their own way, but subject to the council's approval.

In planning large areas the principal lines of existing roads must be carefully marked on the map, and their improvement by widening and reconstruction considered under the scheme, new arterial roads shown, but whether the cost of these are to be borne by the authority or the owner or jointly is a question for arrangement, and unless the council are prepared to expend a large sum of money the negotiations must necessarily be very delicate.

Under the Sutton Coldfield scheme, whenever an owner deposits a plan for a new street it will be necessary for him to submit a plan showing how he proposes to lay out the whole of his estate; this plan should have all the roads marked on, the probable arrangement of building sites, with the type of house he desires to erect. From this plan it will be possible to judge how the roads will affect the adjoining estates, and also to decide the nature of the traffic the roads will have to carry, and so classify each road for width and construction in accordance with the sheets of sections prepared under the scheme.

* Read as a paper at the Annual General Meeting and Conference of the Institution of Municipal and County Engineers, held at Cheltenham.

The various classes of roads can only be [illegible] by scheduling different sections, which [illegible] raises the question of how far can the [illegible] at present in force be relaxed. It seems to me that the only person advantaged for such a step is the [illegible] road making, and [illegible] the expense of developing, especially [illegible] are projected.

Now this should not be done at the sacrifice of [illegible] construction and strength of the road [illegible] ought to be to build stronger roads to deal [illegible] by the new type of traffic. The only relaxation, therefore, that can be safely made is to narrow the [illegible] parts of a road to a minimum.

In connection with the laying out of an estate, how [illegible] roads are to be permitted is an important question. Generally speaking, there are great objections to these roads, especially as they have been [illegible] in the past.

In the two schemes which have already received the [illegible] Local Government Board no [illegible] of deviation from the Streets and Buildings By-laws is contemplated. As regards streets, the only important variation is in the widths of carriageways, and in respect to buildings, while one scheme does not [illegible] the other rather increases the restrictions than otherwise, and includes many important clauses dealing with [illegible] which are not to be found in the existing [illegible].

Allotting to [illegible] land a fixed number of [illegible] is, for instance, to be an easy task, when one is brought in contact with the diverging ideas of the number that different owners have the task is more difficult, and, in my opinion, the only reasonable way this can be done is to limit the larger owners to an average number to the acre extending over the whole of their land, with a maximum number for any one acre, so as to allow as much variation in laying out the houses on their estates as possible, and then to restrict the smaller landowners to a fixed number on their land to conform with the number on those of the larger owners' estates.

Much has been written and heard on the necessity [illegible] relaxing the building by-laws under town planning schemes, but so far no definite proposals have been made seriously to deviate from the by-laws made under the Model code issued by the Local Government Board, neither have I yet met a surveyor having the responsibility of enforcing the existing by-laws who consider they are too stringent if substantial and healthy houses are to be erected. It is generally overlooked by laymen that building by-laws are framed to control every description of building, and that they are most needed when buildings of an entirely speculative character are being erected, the type of house that is built to-day and sold to-morrow. We may take it that the speculator is quite indifferent to the important matters necessary for the health and comfort of those who are to occupy the dwellings he builds, as a rule, with the idea that it is only necessary that the appearance should remain sufficiently attractive until a sale is effected.

It is well known there are many parts of a building not covered by the by-laws, and at the same time there are by-laws which may inflict a little hardship in special cases, but as a whole the existing Model By-laws are the minimum precautionary measures that can be enforced to obtain a proper standard of building, and no relaxation can safely be adopted if this is to be maintained under town planning schemes; probably discretionary powers could with advantage be given to authorities to deal with special cases.

A very delicate point to arrange is the provision and maintenance of open spaces, whether they are to be public or private; it would seem that if parks or laid-out gardens are required they should be provided and maintained at the public expense; small open recreation grounds or playfields may be either for public or private use, and their control should be in accordance with their proposed use in either case.

The one great drawback to open spaces, whether they are playing fields or ornamental grounds, is the maintenance and upkeep; unless this is done by the local authority, or by the employees of the owners of such estates as provide them, they are likely to become a perfect eyesore and a source of annoyance to those living near; it behoves a local authority therefore to be most careful in framing any clauses in a scheme for the provision of open spaces, and to consider whether they are prepared to maintain them or to see provision that the estates to whom the open spaces are provided are compelled to do so.

PART II.

As soon as the local authority have fixed upon a provisional area it would be wise to rough out a skeleton plan, on which could be delineated the existing principal roads and the direction in which it would be advisable in the best interests of the district as a whole, having regard to the contiguity of the district [illegible] roads

Mr. L. A. Reay-Nadin

constructed in the future. This rough skeleton plan would be an excellent basis on which to build up a scheme, and would allow in the earliest stages suggestions to be sought for and considered while the ordinary preliminary steps under the regulations are being carried out.

Having mentioned regulations, as one of the first to criticise the original regulations and to point out how they were keeping back town planning, the author desires to express his gratification that the Local Government Board have in the recently issued amended regulations considerably reduced and simplified the various requirements. So much unnecessary work and details have now disappeared, that those authorities which have been hesitating in the past to take up this important work of town planning may now be induced to move in the matter. No one can visit the many towns in this country and fail to observe the bad results which have been brought about in the past. It is no use blaming the authorities of those districts; they had not the controlling means in their hands which local authorities now have of preventing these blots, and perhaps in many instances were hampered from lack of means in bringing about alterations and improvements which are always ruinously expensive when attempted to be carried out at the expense of the ratepayers. The extraordinarily rapid growth in many urban districts which has been coincident with the great modern inventions and development of trade consequent thereon, has resulted in hastily-thrown-up neighbourhoods in which every conceivable affront to good taste, and also lack of what is necessary and vital to the health of the community, is manifestly apparent.

Only a well-thought-out and skilfully designed town planning scheme can prevent this same sort of thing in the future, and now that the local authorities have the necessary powers in their hands they ought not to allow the opportunity to pass.

The growth of interest in town planning in every part of the United Kingdom, and also in the Colonies, is most pleasing to those who have taken a keen interest in this truly important subject.

No doubt a good many have recently been reading the interesting report of the Land Inquiry Committee. That committee has rightly concluded that it would be better if the Act of 1909 were amended so as to provide for the making of a preliminary town planning scheme. This should contain certain sufficient provisions to protect the whole of an authority's district and allow of further or more complete schemes

[illegible] in different parts of the area as the local [illegible] Heaviest at [illegible] [illegible] such an [illegible] Mr. [illegible] [illegible] the Stamp Bank.

[illegible] views, with which the author concurs, your time [illegible]

[illegible] contained in the final report of the Departmental [illegible] Having regard to the suggestion that half the cost [illegible] roads, should be contributed by the Exchequer, it [illegible] make provision for the [illegible] existing roads and also for the construction of new roads in such a manner as will permit of a local authority receiving the benefit of the suggested contributions. The [illegible] traffic on all roads nowadays, whether [illegible] due to improvements in means of vehicular transit, has cast an enormous [illegible] and the only [illegible] seems to be that proposed [illegible] The classification of roads will, of course, depend upon the facilities such roads offer, not only to the particular district through which they pass, but to districts which they may serve. That being so, the town planning authority, in preparing a plan, should carefully consider the geographical position of its district in relation particularly to large industrial centres, and should then [illegible] the probable financial effect which would be produced by the increased cost to the ratepayers, on the one hand, on account of making up the additional widths of new roads, or incurred by improving existing roads, and the additional contributions which in the future would be received from the Exchequer for their maintenance on the other. It must not be forgotten that the expenditure for improvements of roads of the above classes is a proper and suitable object for grants from the Road Board.

LOAN PERIODS.

LOCAL GOVERNMENT BOARD INSPECTOR'S PROTEST.

On Friday last Mr. H. R. Hooper conducted an inquiry on behalf of the Local Government Board into an application of the York Corporation for sanction to borrow £1,625 for the purchase of land and houses in Foss Islands for the extension of the depot. The value of the land was estimated at £300, and the town clerk said they wanted the loan for as long a period as the Local Government Board would allow.

The inspector: Haven't the council considered it? Why should they throw the responsibility for the management of their finances on the Local Government Board? If this were granted for sixty years, it would mean that this piece of land, valued at £300, would cost the ratepayers before they were finished with it £1,000 in interest. Local authorities should be anxious to get these little amounts paid off in a few years, and not run them on over an enormously long period. If the whole purchase—£1,600—were paid for in one year it would not cost more than a penny rate.

Ultimately it was agreed to ask for a period of twenty years.

Sewage Sprinklers.—Tenders of the Ames Crosta Sanitary Engineering Company, Limited, Nottingham, have been accepted for the two 50-ft. diameter rotary sprinklers required at Spondon sewage works, and at Breaston and Draycott sewage works the firm's tender has been accepted for three 54-ft. diameter sprinklers, all of the well-known "Simplex" type. The company have received a repeat order for two additional patent "Simplex" rectangular travelling sprinklers from the Birmingham, Tame and Rea District Drainage Board.

WATER SUPPLY IN THE RAND.

VAAL RIVER SCHEME.

The discussion as to early and a much needed extension of the water supply at the disposal of the Rand Water Board, announced in the last annual report of that authority.

Surveys and investigations made by the chief engineer, Mr. W. Ingham, M.Inst.C.E., M.I.Mech.E., [illegible] for a supply of not less than 10,000,000 gallons a day, the best scheme, from the point of view of capital expenditure and working costs, was Knilfontein on the Zuikerboschrand River, in the Heidelberg district. But the catchment area being only 340 square miles, and the scheme being incapable of extension beyond the quantity mentioned, the board decided to seek elsewhere a more suitable site for the proposed works. The next scheme in order of preference as regards capital and working costs, is that known as the Mount Arabel scheme, which is also in the Heidelberg district, the site of the dam being below the junction of the Blesbok and Zuikerboschrand Rivers. In this case the catchment area is about 1,000 square miles, including that of Knilfontein, and would probably yield a supply of 20,000,000 gallons a day, after allowing for a succession of three dry seasons. The board was at first disposed to adopt this scheme, but the further investigations made and the more detailed particulars obtained by the chief engineer regarding the annual rainfall, evaporation and run-off, the possibility of dams being built on the far East Rand section of the catchment area, the mineral prospects of the district, the extent of the farming operations carried on, and the probability that these mining and agricultural interests would be prejudicially affected by a large water scheme, weighed against the advantages of the scheme, and so the board finally determined to reject it.

The possibility of the economic use of the Vaal River as a source of supply was then considered. Mr. Ingham had previously reported on four sites on this river where a dam could be erected—namely, Koppiesfontein, Englebrechts Drift, Kaffirs Drift, and Lindequees Falls—but the three first mentioned were situated too far away from the Rand and from the nearest coalfields to be economically possible for the board's purposes. Having, however, consulted with the Director of Irrigation for the Union, the chief engineer was able to formulate a scheme by which water could be impounded at Koppiesfontein, and from there passed down the natural channel of the river to Vereeniging, a distance of about 47 miles, and caught up at the latter place by a small weir, and from there pumped to the Rand. If this scheme were adopted the board was given to understand that it would be given legislative powers by which it would be enabled to prevent the unlawful use of the water by other persons, and to protect the board's property in the water in its passage down the river. Although, theoretically, this scheme was open to no greater objection than any other river scheme which might be adopted, the board considered that, in practice, difficulties would inevitably arise, and this view was upheld by a leading South African counsel to whom the question was submitted for opinion.

Before finally coming to a decision in this matter, further investigations were made by Mr. Ingham with the object of ascertaining whether some other site, suitable from the engineering and financial points of view, could not be located on the Vaal River from which water could be pumped direct to the Rand, instead of, as in the Koppiesfontein project, impounding it at one place and abstracting it at another many miles away. The chief engineer accordingly made a very careful survey of the long stretch of river between Villiersdorp and Parys, a distance of 147 miles, and having collated and compared the data so obtained, he found that the direct pumping scheme which could be carried out and worked at the lowest cost, and which would be unobjectionable from the engineering point of view, is that referred to as the Lindequee scheme. As regards capital expenditure, this scheme is estimated to cost about £76,000 more than the Koppiesfontein-Vereeniging scheme, but considerably less than any other Vaal River scheme considered; the working expenses, however, will be lower than any of the other Vaal River schemes referred to. The catchment area is about 17,200 square miles, as against 7,620 square miles in the case of Koppiesfontein, and there is the further advantage

of being able to pump direct from the reservoir at Vereeniging, which is the nearest point of the Vaal River to the Rand, and where coal is cheap and abundant.

Having carefully considered and compared the merits of the schemes mentioned above, the board came to the conclusion that for a permanent and reliable supply of from 10,000,000 to 20,000,000 gallons a day, obtainable at a reasonable cost as to capital expenditure and working expenses, the Lindequee scheme appeared, in all the circumstances, to be the most suitable for the board's purposes. The selected site is situated about 23½ miles below the Vereeniging Railway Bridge and some 15 miles in a direct line above the small town of Parys. The impounding structure which it is proposed to erect is a barrage, which will not only be cheaper than a masonry dam, but will possess the additional and important advantage of being more suitable for controlling the heavy floods which sometimes occur in the Vaal River. Structures similar in design to that proposed by the board have been used on Indian rivers and elsewhere in recent years, and have been found eminently satisfactory. Contrary to the usual practice in such matters, it will be necessary to pump at a point about 17 miles below the upper end of the reservoir instead of from the barrage site. This, however, will not be attended with any real difficulty, as it appears that the fall in the level of the river-bed between Vereeniging (where the pumping station is to be situated) and the barrage at Lindequee is comparatively small, being only 8 ft. over the whole distance of 22 miles. The cost of the whole scheme is estimated at £1,146,700, exclusive of the cost of raising the fresh capital required.

Oilcans.—In addition to 7,000 of their patent seamless oilcans recently delivered to the Navy, Messrs. Joseph Kaye & Sons, Limited, Leeds, have now received orders from the War Department for the immediate delivery for 3,000, making 10,000 in all.

Waterproofing of Cement.—The waterproofing of cement tanks and swimming baths is naturally of the first importance, and many architects have given very favourable reports indeed of the efficacy of Pudloed cement in this direction. Among the latest swimming baths to be treated is one at Kirkham (Lancs).

A Glossary of Road Terms. By H. Percy Boulnois, M.INST.C.E. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 2s.—Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he had made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before.—*Portsmouth Times.*

ROAD IMPROVEMENT IN BO'NESS.

By J. LOUDEN,

Burgh Surveyor.

Our efforts during the past three years have been directed to experimenting on our roads with a view to ascertain the most satisfactory and economical method of improving the surface of macadamised roadways.

Selected portions of our roadways, both on the higher and lower reaches of the burgh, were treated in the following manner:—

(*a*) Tar-spraying the surface and dusting with whin chips.

(*b*) Coating the roadway with machine-broken whinstone metal, dry rolled, bound with ¾-in. tarred gravel, and rolled until thoroughly consolidated.

(*c*) A primary coat of 2-in. tarred metal covered with a coat of ¾-in. tarred gravel.

(*d*) Coating the whole surface of the roadway with tarred aggregate metal composed of 2-in. whinstone metal mixed with 25 per cent of gravels ranging from ⅛-in., ¾-in. and 1½-in.

(*a*) and (*b*) were adopted on the higher or residential districts of the burgh, where the traffic is light or moderate.

(*c*) and (*d*) were laid on the low-lying roads, where there is considerable traffic.

A careful note of the cost of each method, including labour, materials, &c., was kept. These are given in the accompanying table, as also the increased cost over the ordinary method of laying water-bound macadamised roads.

As a result of those experiments, tar-spraying for the roads with light traffic, and coating with tarred aggregate metal for the low-lying roads subjected to heavy traffic has been adopted as giving the best and most economical results.

Last year further sections of our roadways were treated in the above-mentioned manner, and so far the results have given satisfaction.

The cost in the case of the tarred aggregate method worked out at 2s. 4d. per super. yard, including tar-spraying surface. The extra cost thus incurred included the strengthening of the sub-crust of the roadway.

As a substitute for tar in spraying the surfaces of the roads, I have adopted the use of Fluxphalte this year. This material, it is anticipated, will form a better carpet for the roadway, and give a more lasting surface. I cannot yet, however, speak of this material from experience.

The initial cost in covering the surfaces of our roads in this way is greater, but the yearly maintenance, in my opinion, would not greatly exceed the old method, provided, of course, there is no excessive increase in the cost of materials.

BO'NESS ROADS: COMPARATIVE COSTS.

Date of laying each section.	Reference letter of method referred to.	No. of superficial yards.	Cost of ordinary method.	Extra cost of new over old method.	Rate per superficial yard, old method.	Rate per superficial yard, new method.	Remarks.
			£ s. d.	£ s. d.	d.	s. d.	
June, 1911	Method A	6,791	275 18 6	42 9 9	9½	11¼	The extra cost over the ordinary method is 1·5d. per super. yd. With moderate traffic this section presented a good surface for two years. This method has been extended, a total of 14,624 super. yds. having been laid. When recoating the road the best results are obtained by binding the metal with chips and tar spraying thereafter.
July, 1911	Method B	2,542	94 18 0	19 10 4	9½	11¼	The extra cost involved equals 2d. per super. yd. The top coating was found to be too fine, and the surface was broken up during the first winter.
August, 1911	Method C	1,441	67 10 0	33 3 10	11	1 4½	The metal used in the old method for this section was hand broken, and the price per yard is consequently higher. This section has been sprayed each summer since it was laid down and still presents a good surface.
July, 1912	Method D	4,400	162 12 0	130 15 0	8½	1 4	This section was tar-sprayed last summer, and during the past winter, in spite of considerable traffic, there was almost an entire absence of mud, and the surface is still very good.

Institution of Municipal and County Engineers.

THE CLEETHORPES MEETING.

[illegible] quite up to the expectations of either the surveyor. [illegible] two papers submitted to the meeting were none the less instrumental in producing an altogether excellent discussion, a variety of interesting points being raised by the several speakers, as our report of the proceedings shows. Mr. [illegible] president, was in the chair, and there were present [illegible] (Newark), E. [illegible] Sheock (Westminster and Leeds), J. S. Alford (Westminster), E. Picker (Beverley), H. Gilbert Whyatt (Great [illegible]), W. Wainwright (Hessay), E. H. [illegible] (Hinckley), hon. district secretary, C. H. Waithman (Cleethorpes), R. H. Jenkins (Skegness), O. Hellawell (Willington), T. Waddingham (Grimsby), H. Dearden (Doncaster), J. Hunter (Lincoln), J. H. Dr[illegible] (Wat[illegible]-on-Dearne), T. P. Frank (Newark), F. W. Wright (Ilkeston), T. Palmer (Lincoln), D. M. MacBrair (Lincoln), F. Rodgers (Gainsborough), J. Dudley Robinson (Worksop, secretary), S. M. Mason (Grimsby), E. W. Turner (Cleethorpes), L. W. Pye (Cleethorpes), T. L. Moore (Skegness), G. T. Paget (Gainsborough), J. McKie (Cleethorpes) and J. W. Houghton (Cleethorpes).

Alderman W. Grant, chairman of the district council, said it was his pleasing duty to give them a hearty welcome to Cleethorpes. He had watched the growth of Cleethorpes, and had done his best during the past twenty years to make it what it was.

The President (Mr. [illegible] Pickering), in acknowledging the welcome, observed that the reputation of Cleethorpes as a health and pleasure resort would under normal conditions undoubtedly have attracted a much larger number of their members that day. He need, however, scarcely apologise for the small attendance at a time when their country and other [illegible] were passing through such great trials. He thought they would agree that it was essential to the health of the community at large that the work of sanitary authorities should, as far as possible, continue, and thanks to our insular position and maritime supremacy, they were able to carry out these important works in comparative safety. The Cleethorpes council was apparently one full of enterprise, and as an institution they appreciated a local authority whose object was the health and welfare of the community. He was quite sure their visit would be both pleasurable and profitable to them, and that their pleasure would be greatly enhanced by the hearty manner in which they had been received.

The president announced the following apologies for inability to attend the meeting: Messrs. E. G. Mawbey (Leicester), W. J. Hadfield (Sheffield), E. B. Martin (Rotherham), F. O. Kirby (Doncaster), T. Henry (East Retford), H. W. Smith (Scarborough), F. R. Ryman (Stamford), and C. F. Hodgson (Otley).

Mr. H. Gilbert Whyatt stated that he had received a letter of apology from Mr. Purnell Hooley, of Nottingham, who was on duty with the Territorials, and Mr. J. Horton, of Derbyshire.

THE MUNICIPAL WORKS OF CLEETHORPES.

By Chas. H. Waithman, Assoc.M.Inst.C.E.

Cleethorpes is situated at the mouth of the Humber, immediately opposite Spurn point, and adjoins the county borough of Grimsby. The town derives its name from "Cleis" and "Thorpe," Cleis being the Celtic prefix meaning chalk and Thorpe the Saxon for village or hamlet. Cleethorpes remained a civil parish until 1873, when the Cleethorpes-with-Thrunscoe Local Board was formed, and became an urban district in 1894. The progress of the town was slow up to 1885, and it was not till 1896 that real development and improvement was commenced, since when it has continued to increase in size and importance as a health resort. Geologically it is almost entirely upon boulder clay, with erratic layers of soft sharp, [illegible] and [illegible] peat with chalk beneath, at an average estimated depth of 80 ft.

GENERAL STATISTICS.

The area of the urban district is [illegible] high-water mark, 1,184 acres; between high and low water mark, 901 acres; total, 2,085 acres.

The increase which has taken place in population and rateable value is as follows:—

Rateable Value. £	Date.	Population.
8,087	1881	2,747
11,876 ...	1891	4,596
[illegible]	1901	12,578
26,100	1911	21,417
[illegible]	1913	24,000

During the summer months there is a very large influx of visitors, as many as 50,000 on a Bank Holiday. The death-rate for the year ending December 31, 1913, was 10·4, and the birth-rate 25·9 per 1,000. The total indebtedness of the council at the present time is £115,000. A 1d. rate produces £347.

HIGHWAYS.

There are 18 miles of road repairable by the council, their construction being: Granite paving (tramways), 2·5 miles; granite tar-macadam, 9·5 miles; tar-macadam, 6 miles; total, 18 miles. The granite paving which is maintained by the Great Grimsby Street Tramway Company consists of Norwegian granite setts on 6-in. Portland cement concrete. The materials used in macadam construction are Quenast, Rhenish basalt and whinstone, from each of which good results have been obtained.

Tar-macadam construction has been carried out with tarviated Inverkeithing granite, tarred Kinton-Lindsey limestone, Frodingham and Wellingborough slag and Derbyshire limestone. The latter bottoming, graded 1-in., 1½-in. and 2½-in., topping ⅝-in., subsequently tar-painted, has given the best results. In 1912 the author reconstructed Tiverton-street, using 2-in. dry whinstone granite, bound with ⅝-in. tarred limestone, surfaced with ⅝-in. topping, and tar-painted. This road, which is subject to a considerable amount of traffic, is in excellent condition. The cost was 2s. 8d. per yard super.

TAR-PAINTING.

A considerable amount of tar-painting is carried out each year. In 1913, 150,384 yds. super. were done, the method of applying being with the Cantar spraying machine and the author's reservoir tar broom. Excellent tar is obtained from the Cleethorpes Gas Company at 38s. per ton (2d. per gallon). An analysis of the cost of last year's work is as follows:—

Total cost.	£	s.	d.	*Cost per yard super.*	d.
Labour ...	95	6	4		
Team labour ...	81	13	4	Labour .	·19
85½ tons tar at 38s.	149	3	9	Tar .	·22
285½ tons slag chips at 5s.	74	17	6	Slag chips ..	·15
Total ...	350	0	11	Total ...	·56

1 ton of slag chips covers 125 yards super.
1 ton of tar covers 1,700 yards super.
1 gallon of tar covers 5 yards super.

SCAVENGING, STREET WATERING, ETC.

The urban area is divided into six districts, each district having three sweepers and one man with handcart. All main roads are scavenged twice each day, other roads once.

For the purposes of street watering the district is divided into three: main roads are watered three times daily, other roads twice.

All repairs and maintenance work is carried out by direct labour. [On p. 385 is a summary of the cost of highway maintenance during the last five years.]

SANITARY AND BUILDING—BY-LAWS, ETC.

The building trade in the district is very active, and during the year ending December 31, 1913, plans were passed for 223 new houses and over 100 for alterations and extensions. The by-laws in force were approved by the Local Government Board in 1904. The framing of new by-laws is engaging the attention of a sub-committee of the present Town Council, discussion has from time to time taken place

in connection with the erection of "sheds and temporary buildings," and a standard specification has recently been adopted, as a result of which it is hoped that the erection of certain buildings which inevitably become a nuisance will be prevented. The principal points now under discussion by the subcommittee are: (a) The thickness of walls, (b) the height of rooms (with a special reference to the room in the roof and the attic), (c) improvements in concrete for site and foundations.

STABLES AND HIGHWAY DEPOT, ETC.

The council have at the present time fourteen horses, six for highway purposes and eight for the collection of house refuse. The stables and depot are situated in Poplar-road, and are adjoining the refuse destructor and pumping stations, while the fire station is situated in the depot yard itself.

FIRE BRIGADE.

The brigade is voluntary, one and consists of fourteen members, the equipment being: Poplar-road fire station—Merryweather's Gem fire engine (pumping capacity 350 gallons per minute); first-aid auto-car, with smoke helmet, &c.; hose cart: fire escape, No. 1 sub-station, Yarborough-road—Hose cart No. 2 sub-station, Barcroft-road—Hose cart. Fire-escape station, New Cleethorpes, Blundell-avenue.

The district is well provided with fire hydrants, and attention is always given to this matter when new streets are being laid out. In July, 1912, the brigade, competing at Spalding against others of the North-East division of the Fire Brigades Union, won the silver cup for steamer drill.

CLEETHORPES PROMENADE.

PARKS AND RECREATION GROUNDS.

Sidney Park, situated on the south end of Cleethorpes, is 12 acres in extent, and contains a large model yacht pond, bowling greens, tennis courts and croquet lawn, park-keeper's lodge, shelters and greenhouses. There is an extensive and elaborate flower garden, which, with the Kingsway Gardens, is under the superintendence of a head gardener and a staff of nine men. The park was the gift of the Sidney Sussex College, and was opened in 1904, the cost of laying out, &c., being £5,000. The Sidney Sussex College have recently given a further 6 acres for park extension and 8 acres in the central ward for a recreation ground.

METEOROLOGICAL STATION.

In 1909 the council equipped a meteorological station, where daily records are taken. The station comprises the following instruments: Barometer, dry and wet bulb hygrometer, maximum and minimum thermometers, anemometer, rain gauge, and Campbell-Stokes sunshine recorder.

ESTATE DEVELOPMENT, PRIVATE STREET WORKS, ETC.

The Private Street Works Act, 1892, was adopted in 1893, since when upwards of fifty roads and back ways have been made up. The average cost has been at the rate of 15s. per foot frontage, or 7s. 6d. per yard super., for 36-ft. roads. There are at present three important estates in course of development—the Cleethorpes Boulevard estate, Hey's estate, Sidney Sussex College estate. The latter estate is about 500 acres in extent, and 1 mile 184 yds. of new roads have been made by the estate and taken over by the council during the last seven years, while 1½ miles have been made up and dedicated by the Boulevard estate in the last seven years. The work is carried out in accordance with the council's specification and requirements, after which the street is formally inspected and subsequently adopted. The council's specification provides for the following construction and materials: Carriageway for 36-ft. and 30-ft. roads—12-in. chalk foundation and 4-in. tar-macadam; for 8-ft. and 12-ft. back roads—8-in. chalk foundation and 4-in. tar-macadam. Kerbs and channel.

In streets abutting on certain thoroughfares the corners should be to a radius of 30 ft. to the outside edge of the kerb and in side thoroughfares 18 ft. Various kerb (12 in. by 6 in.) and channel (10 in. by 6 in.) to be of an approved granite. Straight kerb (12 in. by 4 in.) and channel (10 in. by 6 in.) to be of approved hard York. All to be laid on 6 in. of Portland cement concrete (8 to 1). Footways to be laid with concrete slabs 2 in. thick from certain approved firms. Sewerage.—Certain patent jointed pipes are specified for use in good and bad ground. Gully connections and builders' junctions are to be put into the back edge of the footpath in the same class of pipe as the sewer. Manholes and flushing chambers to be constructed in accordance with details supplied by the surveyor. No building is allowed to be commenced in any new street until such street has been staked out according to approved plan and section.

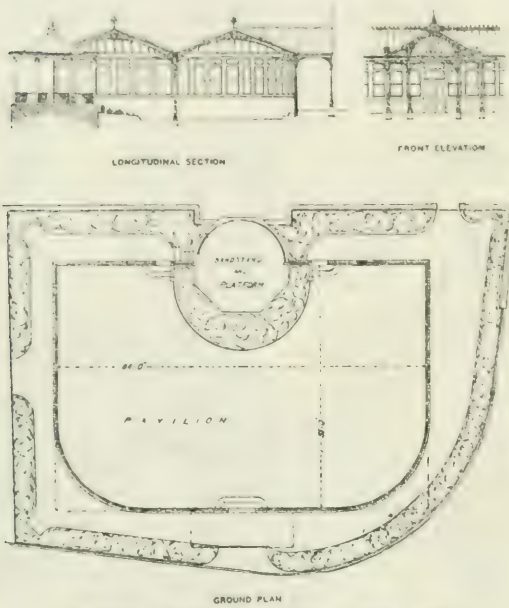
Year	Mileage.	Maintenance repairs improvements	Scavenging and watering.	Total	Rate per mile maintenance	Rate per mile scav., &c.	Total rate per mile.
	M. F. Y.	£ s. d.	£ s. d.	£ s. d.	£	£	£
1909	17—1—75	1,341 1 5	1,619 1 2	3,235 2 7	91·01	91·30	182·71
1910	17—2—91	2,357 0 0	1,858 0 0	4,215 0 0	133·06	109·09	242·15
1911	17—1—78	836 7 5	1,529 3 3	2,375 10 7	46·75	86·93	133·66
1912	17—1—201	2,467 12 3	1,512 5 9	3,949 18 0	140·08	87·70	227·21
1913	18—2—[illegible]	2,052 19 8	1,028 2 4	3,080 13 0	112·33	89·10	201·43

[illegible] £2,261; gardens, rockery, planting, &c., £[illegible]; shelters and seats, £1,263; total, £21,422.

Other improvements which have been carried out on the pathway are as follows:

KINGSWAY PAVILION.

The bandstand was erected in 1913 together with an open-air enclosure. In connection with this, which was the first step towards providing any form of entertainment on the Kingsway, a concert party was engaged during the week, the council themselves providing sacred concerts on Sundays. So successful was this undertaking that at the close of the season of 1913 it was decided to cover in the enclosure, and the author was instructed to prepare a scheme. The tender of the Falkirk Iron Company was accepted in the sum of £908 17s. 6d., the wind-screens, brickwork, &c., being tendered for locally. Details of the complete cost are: Falkirk Iron Company (including Pennycook's patent glazing for roof), £908 17s. 6d.; wind-screens, £335; stonework, £45; brickwork, £62 10s.; painting, £50; planting, &c., £50; preparation of foundations, £50; total, £1,501 7s. 6d.



Proposed Kingsway Pavilion, Cleethorpes.

UNDERGROUND CONVENIENCE.

Male.—Accommodation of eighteen urinal stalls and five water-closets, store, &c., is provided. The floor level is 4 ft. 3 in. below the adjoining ground level. This level was governed by the invert depth of the Kingsway sewer. Interior lined with glazed bricks; water-closets divided by the Shepwood patent partition; roof of Mellowe's patent glazing. The cost was £500, exclusive of direct labour in connection with entrances, planting shrubs, &c.

SHELTERS.

Two new shelters were erected on the Kingsway in 1913, and were designed to include a small shop; from each of which a rental of £15 per annum is derived. The cost of each shelter was £150, but the Local Government Board excluded from the amount sanctioned the cost incurred in connection with each shop.

PIER-APPROACH SHELTER.

This improvement was carried out at the beginning of 1913, and provides shelter accommodation for about 800 persons, while a lavatory is provided at one end and cloak-room at the other. The elevation is in terra-cotta, the roof in reinforced concrete. The cost of the work was £500.

PIER, PROMENADE AND FORESHORE.

The promenade, from end to end, is 1½ miles in length, of which two-thirds is owned and maintained by the Great Central Railway Company, who also own the pier, pier gardens, Highcliffe Gardens, together with numerous shops and restaurants along almost the entire frontage. The urban council own the rights of the foreshore, and an income of £1,000 per annum is derived from the rents of stalls, hire of chairs, &c.

GROYNES.

The groynes along the front of the Kingsway were constructed on the advice of the late Mr. W. T. Douglas, M.INST.C.E., at a cost of £570. They are 800 ft. and 400 ft. in length. It was anticipated that they would be the means of collecting sand along the wall, but in this respect they have failed to achieve their object. At the end of 1912 the author carried out experimental works at the south end of Kingsway. One 800-ft. and one 400-ft. groyne were removed, and two short groynes, built up at the land end, were constructed at an angle of 30 degrees further south, and by this means it was hoped that sand would collect; but while the sand which formerly remained outside the 800-ft. groyne has extended inwards, there has been nothing in the shape of an accumulation against the wall.

PUBLIC CONVENIENCES.

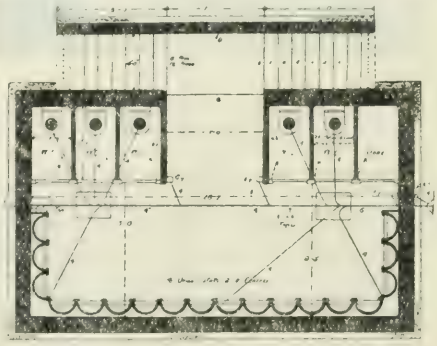
Conveniences for both sexes were constructed in Sea-road in 1907. For females seven water-closets with lavatories and cloakroom provided, and for males eleven urinal stalls and six water-closets, lavatories and cloakrooms. Public conveniences are provided for both males and females on the Thrunscoe Pleasure Grounds (males, three water-closets, seven stalls; females, four water-closets), a ladies' lavatory on the Kingsway (four water-closets), conveniences (male and female) in Sidney Park (males, three water-closets, seven stalls; females, three water-closets), underground convenience (male) in Brereton-avenue (two water-closets and six stalls), and, as already described, underground convenience (male) on Kingsway. In addition to these the Great Central Railway have provided accommodation on their promenade.

STREET LIGHTING.

The streets are lit throughout under contract by the Cleethorpes Gas Company. There are 410 lamps, divided up as follows: 375 single-burner ordinary incandescent, 14 high power, 21 multiple-burner high power.

ELECTRICITY UNDERTAKING.

In 1912 the council initiated an electricity undertaking; the supply is obtained under contract from the Great Grimsby Tramways Company, at the power station, which they lease from the council.



PLAN

Kingsway Convenience, Cleethorpes.

At present an area in the North Ward only is cabled, and in connection with this loans were sanctioned as follows: Cables, £3,914; services, £456; meters, £130.

The cables laid are of the vulcanised bitumen type, and are laid on the three-wire distribution system,

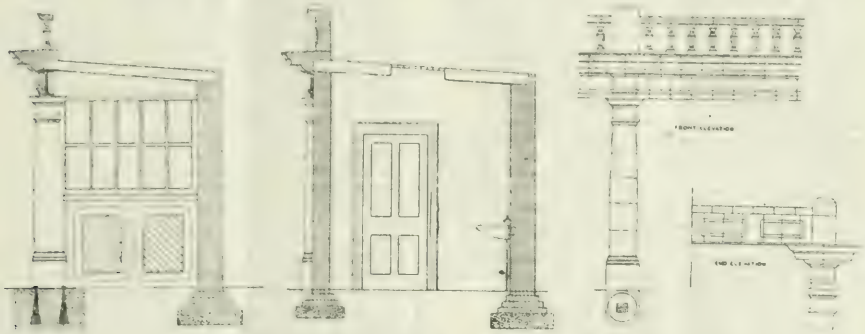
giving a pressure of 230 volts on either side, 460 volts across the two outers, laid in earthenware troughing filled in with bitumen, and protected on top with tiles of 1 in. thickness. The total length of cables laid is 4,197 yds.

REFUSE DESTRUCTORS.

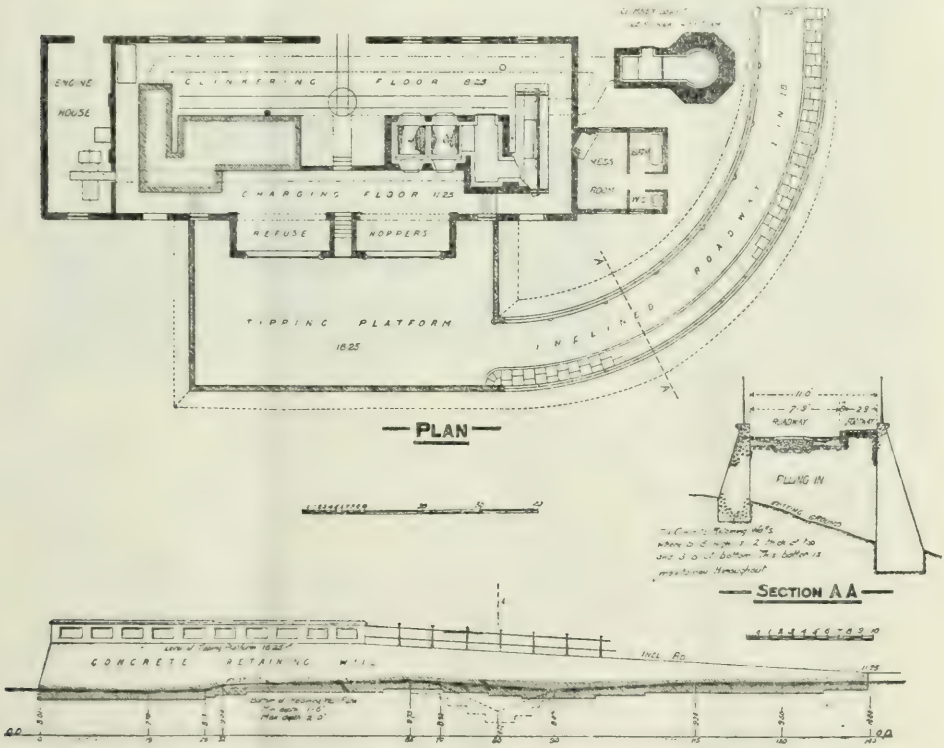
Although refuse destructors are so frequently mentioned in the papers submitted at the various meetings of the institution, the author, while avoiding comprehensive details of the Cleethorpes destructor, feels that there are some points in connection with the scheme, and particularly with the Local Government Board inquiry, that may prove of interest, together with the fact that in inspecting the work the members will have the opportunity of seeing an up-to-date plant at a very interesting stage—viz., one two-cell unit completed and the other partially completed.

The original scheme, which was prepared by the author in 1912, was for a three-cell back-fed destructor, provision being made for a one-cell extension, the estimated cost being £4,000. Application was made to the board accordingly, and as the result of the inquiry the board asked for (a) The construction of two separate sets of furnaces, with provision for a one-cell extension to each; (b) an increase in the height of the chimney shaft from 100 ft. to 125 ft. (c) the construction of the inclined roadway in either brickwork or concrete. An amended scheme embodying the requirements was submitted, and was sanctioned by the Local Government Board, and the tender of Messrs. Manlove, Alliott & Co., in the sum of £6,500, accepted. The site selected is admirably situated, being central, easy of access, and adjoining the council's depot, yard, pumping station, &c.

With regard to the utilisation of the steam generated at the destructor for sewage pumping, this matter was



Cleethorpes Pier Approach Shelter Details



Cleethorpes Refuse Destructor: Inclined Roadway and Tipping Platform.

[illegible] repeated upon by the author and Mr. [illegible], but, having regard to an [illegible] it was felt thought that it would [illegible] a resident or an [illegible] course to adopt [illegible] to use the steam in [illegible] the laying of tar macadam and concrete [illegible]

The [illegible] is a [illegible] [illegible] adding a [illegible] [illegible] capacity of each and [illegible] approximately, [illegible] giving a total capacity for the plant [illegible] of [illegible] with approximately a population of 30,000, and which and it extended as provided for 75,000. The height of the [illegible] [illegible] reached by an [illegible] with concrete retaining [illegible] having a gradient of 1 in 18. A [illegible] chamber is provided to each [illegible] two Babcock & Wilcox water-tube [illegible] a heating surface of 896 super. ft. each, [illegible] at a pressure of [illegible] The [illegible] steam [illegible] by steam [illegible] power. The buildings are of brickwork with stone dressings. Mess-room, bath and sanitary offices are provided.

DISCUSSION

Mr. R. H. [illegible] (Skegness) moved a vote of [illegible] to Mr. Wardman and Mr. Alford for their [illegible] to the Proceedings of the Institution. With regard to the tar-painting of the roads, they must certainly congratulate Mr. Wardman on the [illegible] which this work was carried out, although he had [illegible] anything in his statement as to the cost for fuel and repairs of apparatus. Both tar and slag chippings were very cheap in the [illegible] but there might be some reason for this. As far as slag chippings were concerned, they were [illegible] Cleethorpes. He considered it paid to use both tar and chippings liberally, because if the [illegible] thoroughly done it saved money in road maintenance. He had roads which had been tar-painted which were in good condition as they were six years ago. Street watering and scavenging in a [illegible] Cleethorpes, where there would be a good many visitors, was an important matter, and he would like to ask if the scavenging was augmented in the summer months, and in what way. This was a [illegible] question when one came to the way [illegible] men could find other employment during the summer months. It seemed to him that [illegible] men, three horses and one man with the cart—must be expensive. He would like to ask whether the cost of watering could be separated from the street scavenging in the cost per mile. Watering was a very fluctuating item, and from the way in which the street scavenging was carried out it would be specially interesting if the information was given. With regard to by-laws, he noticed that [illegible] was engaged in framing new by-laws with dampcourses, temporary buildings, and other matters. Temporary buildings presented a difficulty in any seaside town where they wanted to keep the place respectable. He should like to know if their regulations in Cleethorpes were satisfactory. What [illegible] would they [illegible] putting up a "shanty" in the back garden of his house? To require the party walls to be of the ordinary thickness of external walls appeared hard; and his council were asking the approval of the Local Government Board [illegible] required in party walls, but for the foundations to be increased and strengthened for buildings of certain heights. He had never fully [illegible] in rooms in the roof. So far as private street works were concerned, the Cleethorpes Council had a very stringent [illegible] would be interested to know [illegible] case had come before the magistrates in which the owners had objected to the tar-macadam. [illegible] the magistrates, and the Bench had held that, while for future development it might be a good thing, they were against it as a requirement for private street work. The chairman of the Bench was against tar-macadam, which, he said, was a fad of the engineer. The Skegness Council had promoted a Bill in Parliament in which they asked that, instead of the magistrates being the Court of Appeal, an arbitrator should be appointed by the president of the Institution of Civil Engineers to act as the court of appeal. He felt sure that with the engineering knowledge which such an arbitrator would have they would get better decisions. He noticed that in streets on main thoroughfares they were cutting the corners to a radius of 30 ft. With regard to the bringing of builders' junc[illegible] good if they could be used. But did they find that these junctions were in the correct positions for the [illegible] public conveniences, he was pleased to see that Cleethorpes had provided so liberally for visitors. Did [illegible] of the income from this source. With regard to street [illegible] gas company, and no doubt they had excellent terms for street lighting. At Skegness they found they could maintain the lamps and light them at a cheaper rate than given by the company. He would like to know whether the electrical undertaking in the North Ward had been a financial success.

Mr. H. Gilbert Wrayer (Grimsby) seconded the vote of thanks. Regarding tar-macadam, he thought they ought to congratulate the Cleethorpes Council upon the large amount of this material they were able to get down. He had once had on his council a member whose horse had happened to fall on a stretch of this class of paving, the consequence being that he was debarred from introducing tar-macadam for many years. As to rounded corners, while the drivers of motor vehicles doubtless appreciated these, the pedestrian probably found they resulted in these vehicles coming round the corners too fast for his comfort. For vehicular traffic, however, they were of very great advantage, and in Cleethorpes they had gone in for them very boldly and successfully. From Mr. Alford's paper it appeared that the nature of the subsoil, and the fact that sewers had to be constructed on piles, had cost the town a lot of money. He had had the same experience in many parts of his own district. Generally the subsoil was strong boulder clay interspersed with old river beds and old potholes filled with river silt. They had themselves just let a contract for sewers on piling, but on account of the war the contractor wanted extra money which they were not inclined to pay. The time for the discharge of the sewage of Cleethorpes should, in Mr. Alford's belief, commence two hours before high water and terminate two hours after high water. He thought he could agree with that. He had not taken float tests, but he had observed the tide, and thought those hours were better than those laid down by the Humber Conservancy, and he thought when the works were in operation the Conservancy would come round to Mr. Alford's hours. In the next paragraph of Mr. Alford's paper the Grimsby sewage outfall was described as a source of pollution to the shores of both Grimsby and Cleethorpes. From the plan of the district it would be seen that Cleethorpes had outfalls at each end of the district. At the eastern end it was just outside the borough boundary, whereas the Grimsby outfall was ¾ mile further up the river. It was always alleged that any pollution on the foreshore did not come from the Cleethorpes outfall, which was on the boundary, but from the Grimsby outfall ¾ mile away. They had taken tests for a period of years. Those prejudiced in favour of Cleethorpes may not appreciate the figures because they had their own views crystallised. The sewage at both these outfalls was discharged at all states of the tide—that was, when it could come out—and as the tide fell the sewage from all the outfalls was carried away. At low tide the sewage was discharged all over the sand at Cleethorpes, and at Grimsby into a defined channel. As the tide rose it came up the river, and was carried diagonally across the foreshore. It was palpable on the face of it that as the tide rose it washed the Cleethorpes matter on to the Grimsby shores, and also washed their own matter on to their shores. They did not dispute that at all. What he wanted to say was that the remarks of Mr. Alford on the subject were not founded on fact, and might very well have been omitted from his paper. As regarded the acceptance of tenders to which Mr. Alford had made reference, that was a matter in which they all suffered. In Grimsby they had suffered time after time from the withdrawal of contractors on finding how far they were below the next lowest tender. The St. Helens council had adopted a resolution that tenders were to be opened in private, and that the figures were not to be disclosed until the lowest tenderer had signed his contract. Something ought to be done in the matter, and Mr. Alford rightly called attention to it.

Mr. E. H. Crump (Hinckley) said he wished to asso-

made himself with the vote of thanks to the author of the two papers. He was to be especially interested in the paper of Mr. Worthington. A question as to the quantity, and he asked, but there was one point he would like to have seen, and that was whether the cost of painting at the end of ten years was very [illegible] He thought the steel work ought to be taken [illegible] He found nothing in the paper about water. It rather [illegible] whether water was drawn in Cheltenham.

(To be concluded.)

During the [illegible] the members made a tour of a number of the undertakings described in the papers read at the meeting, and on their return were entertained to tea at the Civil Hall by Mr. Worthington.

BEACH PAVILION AT EAST LONDON.

The reinforced-concrete pavilion illustrated in the [illegible] is a view [illegible] of the sea at East London, South Africa. The building, which has been carried out by Mr. J. Powell, [illegible] is situated on the land side of the [illegible]

The internal dimensions of the ground and first floors are 112 ft. by 40 ft. by 14 ft. high. The roof of the building is [illegible] and the whole [illegible]

East London Beach Pavilion.

excepting the houses over the staircase wells, the tops of which appear in the photograph, is used as a roof garden. The floor space, including the roof garden, is about 15,000 sq. ft.

The whole of the reinforcements were supplied by the Trussed Concrete Steel Company, Limited; the staircase railings, lamp pillars, newels, cast-iron gutters, downpipes, and palisading were supplied by Messrs. Walter Macfarlane & Co., Glasgow; the electric lighting was carried out by a firm of local electricians, and the joinery made by local builders. Otherwise the building was constructed departmentally, and cost £1,700.

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Sea Wall Wrecked.—Much damage was caused on the Holderness coast during Sunday and early on Monday morning by the gale and the high spring tides. Thousands of tons of cliff have been washed away, and at Withernsea the new sea wall promenade now in course of construction was wrecked. Fifty yards of concrete wall and thousands of tons of filling were washed away. The damage is estimated at £1,000.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.

Massinger: "The Fatal Dowry," Act ii. 2

THE UTILISATION OF REFUSE.

To the Editor of The Surveyor.

Sir,—As I understand that the Development Commissioners have asked county councils to prepare schemes for the reclamation and cultivation of waste lands, and proprietors of such lands have been requested to communicate with agricultural colleges, I take the liberty to ask you kindly to publish in your accredited columns the following notes, which may be of use to persons and corporations concerned.

The easiest and most natural way of reclaiming waste lands is by giving back to the earth what came from the earth—*i.e.*, by digging into the soil our daily refuse.

This system has been in use in China from time immemorial, and without it it would have been impossible to feed the enormous population of 400,000,000 of inhabitants contained within the relatively restricted area of China proper. The same system is followed in Belgium, Scotland, some parts of England and France, and other agricultural countries.

The system, however, of digging into the soil crude house and town refuse is subject to three main disadvantages—(1) soiled paper and light refuse are liable to be blown about by the wind, and protests against this nuisance, if nothing stronger, have been lodged against municipal authorities in Scotland and elsewhere; (2) crude house and town refuse, if left about in heaps, even when spread out, gives a disagreeable, nauseating and unhealthy smell; (3) however deeply house refuse is dug into the soil, such substances as broken glass and crockery have a knack, after the soil has been ploughed, of coming to the surface, disfiguring the land, and causing injury to the horses and cattle, and even to men.

All these disadvantages can be eliminated at once by passing the refuse through a machine called the "Patent Lightning Dust Manipulator," which is a specially constructed disintegrator and mixer combined. The refuse thus treated is reduced to a uniform mass of the appearance and consistency of mould, from which it is scarcely possible to distinguish it. The whole of the substances composing the refuse are thoroughly amalgamated, so that there remains no soiled paper or other light material to fly about. The refuse is also deodorised by the action of the machine, the only smell that it gives being like that of earth, and the pieces of glass and crockery are reduced to a harmless powder. Tin and iron utensils and boot leather are sold separately at a good profit.

This mould contains, besides a certain percentage of lime, the three plant foods necessary for the fertilisation of the soil in much greater proportions than farmyard manure. A chemical analysis and report by the East Anglian Institute of Agriculture gives the following comparison between house refuse manure passed through a Patent Lightning Dust Manipulator and farmyard manure:

	lb. of nitrogen.	lb. of phosphate.	lb. of potash.
1 ton of good farmyard manure contains ...	10-15	19-23	10
1 ton of house refuse manure contains ...	18	52	11

It is true that the nitrogen in house refuse manure is more slowly absorbed by the soil than that of farmyard manure, but, on the other hand, the latter is more apt to deteriorate owing to the great amount of moisture in it, and the action of refuse manure lasts much longer—over two or three years.

The above-mentioned treatment reduces house refuse to about two-thirds of its original bulk—a valuable consideration in the calculation of transport.

Another advantage is that house refuse manure can be stored in heaps in the open, as it very quickly forms an oxidised crust which soon becomes practi-

[illegible] and on which flies do not alight, [illegible] what a source of flies farmyard manure is.

The [illegible] refuse to a presentable condition is no longer a novelty, a number of municipal corporations—such as Southwark in London, Halifax, Bispham-Blackpool, Hove, Glasgow, &c.—having had it in use, some of them for some years. The Metropolitan Borough of Southwark [illegible] its plant after a year's trial, and now the Corporation of Hove have passed a resolution to quadruple theirs.

The plant takes very little room, is relatively inexpensive, and causes no nuisance of any kind.

Were this mould, without the addition of any other [illegible] or even of any earth, spread 2 ft. or 3 ft. deep, not only over poor land, but even on bare rocks, it would at once give a fertile soil fit to grow any crop.

Farmers who have used this mould as manure recommend it for wheat, mangolds, swedes, cabbages, potatoes, hops, roots, turnips, fruit trees, meadow land—in fact, for any crop. Tomatoes grown in it are larger in size, richer in colour, and sweeter in flavour. Bulbs grow luxuriantly in it. It is also good for flowering plants; a florist grows show chrysanthemums in it to his great satisfaction.

Mr. E. Price, of Hayes, Kent, wrote once to the Southwark engineer's department as follows: "I am very pleased to recommend your crushed refuse, having used it on pasture land for some years past, and have experienced both wet and dry seasons, and [illegible] it on clay and gravel soil. I find it cannot be equalled, and am willing to show the land in this district that has been dressed with it to anyone making an appointment to see it."

The carriage and spreading of this manure over waste land would give work to a number of unemployed, and land that has been utterly useless would, at very small expense, be rendered by this system worth a good deal of money.

I shall be happy to give any officials or landowners any information they may wish to have on the subject. —Yours, &c.,

A. D. Furse.
Manager,
The Patent Lightning Crusher Company, Ltd

14A Rosebery-avenue, E.C.
September 18, 1914.

SANITARY SERVICE.

To the Editor of The Surveyor.

Sir,—The Royal Sanitary Institute has issued a letter to the members and associates calling attention to the circular issued by the Local Government Board to local sanitary authorities with regard to the maintenance of the sanitary service of the country during the war. In reply to this letter the institute has received offers from many of the members and associates to help in carrying on the sanitary administration; these offers are being sorted up and filed for reference purposes.

The council think that it may be of service to local authorities whose staffs have been depleted owing to the war to know that information is available at the institute as to qualified men and women who are able to take up temporary work in sanitary administration, and also as to those who would be willing to give some voluntary assistance in public health work.

The institute will be pleased to afford any information or assistance possible in the matter to authorities who may wish for it, if they will write to the secretary, at 90 Buckingham Palace-road, London, S.W.—Yours, &c.,

E. White Wallis,
Secretary, Royal Sanitary Institute.

90 Buckingham Palace-road, S.W.
September 21, 1914.

Prevention of Down Draught.—A new booklet dealing with the "Perfect" down-draught preventing chimney pot has been issued by the manufacturers, Messrs. J. H. Sankey & Sons, Limited, Essex Wharf, Canning Town, E. By the use of the "Perfect" pot the wind is not allowed to enter the flue, being forced out of large louvre openings instead of down the chimney. In the summer time it acts as a ventilator.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why is it that small packets sent by parcels post to the gallant men at the Front are charged 1s. by the Post Office, whereas similar parcels sent, say, to a "waster" in the extreme North of England would only be charged 5d.? Cannot this unfortunate anomaly be altered by some arrangement with our French ally? Would not the Postmaster-General's popularity be somewhat greater than it is if he arranged for this concession to be made?

* * * *

Do most of us realise that this war may possibly continue for many years? Will not a little reflection show us that, when the Allies succeed in driving the Germans back into their own country, this will only mean the commencement of the struggle to crush their ascendency, and that to lay siege to their numberless, almost impregnable, fortresses will be a formidable task? Does not this point to the necessity for more and more recruiting, if we are ever again to enjoy the blessings of peace?

* * * *

"Lives there a man with soul so dead" that he is not moved to his inmost heart by the recent revelations of the unspeakable horrors committed by German soldiers on innocent men, women and children? Should not his soul be fired with a desire to revenge these outrages by bringing to account not only those who committed them, but those who inspired them?

* * * *

Is it not interesting to hear that 800 men of the Paris Fire Brigade have been sent to the scene of the recent fighting nearest to Paris in order to carry out certain sanitary measures with a view to removing any chances of an outbreak of enteric or other zymotic disease in the neighbourhood? Is not this a curiously modern development of the science of sanitation which is most instructive, and worthy of imitation in this and other lines?

* * * *

Can there be any truth in the statement that the French have in their possession a shell of so deadly a nature that when it bursts the fumes "produce complete paralysis of certain organs of the body, causing instantaneous and painless death to every living thing within its reach"? Is not this story a mere *réchauffé* of an incident in a play which was acted in London a few years ago?

* * * *

Are not the surveyors of this country to be congratulated on the manner in which their roads have withstood the abnormal strain which they have recently had to bear in the transport of large bodies of troops—both cavalry and infantry—as well as heavy field guns and wagons of all descriptions? Has there been a single complaint of damage caused by this "extraordinary traffic"?

* * * *

Was it not rather disappointing to find in last week's issue of the Royal Automobile Club Journal that an article headed "Concerning Shell" did not, as one expected, enlighten one on the new terrible explosive shell which the French are said to possess, but was merely a statement that the British Petroleum Company was a British and not a German concern?

* * * *

Was it not to be expected that the Road Board would notify all the highway authorities in England and Wales that as any traffic census taken at the present time would not show normal figures, it would be well to postpone this work of census-taking in connection with the proposed classification of roads?

* * * *

Was it not a very witty and correct summing-up of the individuals who take an interest in the weather when Dr. W. N. Shaw, F.R.S., of the Meteorological Office, in a speech at the annual dinner of the British Science Guild, quoted the following lines:—

"Tinker, Tailor, Soldier, Sailor,
Gentleman, Apothecary, Ploughboy, Thief,
Airman, Fisherman, Sportsman, Postman,
Railwayman, Newsman, Traveller, Crank,
Colonist, Scientist Underwriter, Lawyer,
Pioneer, Prisoner, Invalid, Tramp."

And above and beyond these "professions" could he not have added "engineer and surveyor," who are bound to take considerable interest in the weather?

The Surveyor
And Municipal and County Engineer.

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PRO PATRIA.

[THIRD LIST.]

In our issue of August 28th we commenced the compilation of an "Honours" list of municipal, engineering and sanitary officials who are taking part in the great war. A most gratifying response was made to our request that readers should assist by notifying us of cases within their knowledge, the number of communications which have reached us being in fact so great that the publication of a second list became necessary last week. A third list is appended.

Baker, John, pupil of the engineer and surveyor to the Cannock Urban District Council, with the 5th Battalion Oxford and Berks Light Infantry.

Barnes, W., assistant surveyor to the Thornton Urban District Council, is a gunner in the RT Section, 11th Battery of the 2nd West Lancashire Royal Field Artillery. He is at present training at Coliton, Edinburgh, and has volunteered for foreign service.

Barron, W., electric supply department, Birmingham Corporation.

Bayliss, G. F., clerk, water department, Birmingham Corporation, Quartermaster-Sergeant, Southern Air Line Signal Company, Royal Engineers (Territorials).

Beesley, R. A., electric supply department, Birmingham Corporation.

Bennett, N., pupil in the engineer's department, Harrow, with the City of London Roughriders.

Bent, F. J., clerk, water department, Birmingham Corporation, 8th Royal Warwickshire Regiment (Territorials).

Bolton, Victor, pupil, surveyor's department, Bushey Urban District Council, with the 2nd Middlesex. For active service abroad.

Bowden, J. Scott, county veterinary surgeon, Cumberland, with the Cumberland and Westmorland Yeomanry.

Bowker, R. B., electric supply department, Birmingham Corporation.

Boyd, C. F., electric supply department, Birmingham Corporation.

Brearley, N. B., electric supply department, Birmingham Corporation.

Brown, D. H., electric supply department, Birmingham Corporation.

Bull, F. H., surveying assistant, Hornsey borough engineer's department, with the Artists' Rifles.

Carey, H. J., electric supply department, Birmingham Corporation.

Carter, J. W., electric supply department, Birmingham Corporation.

Charlton, R., clerk, water department, Birmingham Corporation, sergeant, 4th King's Shropshire Light Infantry (Territorials).

Clayton, F. T., engineering assistant, water department, Birmingham Corporation, Captain, 5th Royal Warwickshire Regiment (Territorials).

Cox, A., electric supply department, Birmingham Corporation.

Cox, H. J., electric supply department, Birmingham Corporation.

Cripps, C. G., clerk, water department, Birmingham Corporation, Royal Field Artillery, 3rd South Midland Brigade (Territorials).

Cullis, E. H., electric supply department, Birmingham Corporation.

Cutts, A. H., clerk, water department, Birmingham Corporation, Royal Army Medical Corps.

Dickinson, Arthur J., surveyor to the Redditch Urban District Council, Major commanding Southern Airline Signal Company, Royal Engineers (Territorials). Has volunteered for foreign service.

Doherty, F. W., clerk, water department, Birmingham Corporation, Royal Warwickshire Regiment (City of Birmingham Battalion).

Edwards, E. A., clerk, water department, Birmingham Corporation, 6th Royal Warwickshire Regiment (Territorials).

Ellison, G., assistant sanitary inspector of Hornsey, with the Royal Army Medical Corps.

Firman, W. H., surveyor's department, Teddington Urban District Council, Territorials, 8th (Reserve) Battalion Middlesex Regiment.

Fleming, H., clerk, water department, Birmingham Corporation, Royal Warwickshire Regiment (City of Birmingham Battalion).

Float, S. E., electric supply department, Birmingham Corporation.

Gibson, D. A., small holdings land agent for Cumberland, with B Company, 4th Border Regiment (Territorials).

Glaze, B. C., electric supply department, Birmingham Corporation.

Godfrey, W. H., clerk, water department, Birmingham Corporation, lance-sergeant, 4th King's Shropshire Light Infantry (Territorials).

Goodall, F., electric supply department, Birmingham Corporation.

Grace, S., clerk, Hornsey medical officer's department, with the 7th (County of London) Rifles.

Green, G. F., clerk, water department, Birmingham Corporation, Royal Warwickshire Regiment (City of Birmingham Battalion).

Grew, H. W., clerk, water department, Birmingham Corporation, Royal Warwickshire Regiment (City of Birmingham Battalion).

Guest, A. T., clerk, water department, Birmingham Corporation, Royal Army Medical Corps.

Gunson, A., treasurers' department, Kendal, with B Company, 4th Border Regiment (Territorials).

Haugh, J. P., chief assistant, surveyor's department, Pontypridd, with the Glam. R.E.

Hayes, F. G., surveyor's department, Kingswood Urban District Council.

Hayes, F. W., electric supply department, Birmingham Corporation.

Hemming, W. H., electric supply department, Birmingham Corporation.

Hill, P. H., electric supply department, Birmingham Corporation.

Hinnell, Harold G., assistant surveyor, Ulverston Urban District Council. Lieutenant 7th Battalion Cheshire Regiment (Territorials). Volunteered for foreign service.

Johnston, Dr. J. M., assistant medical officer of health for Hornsey, with the Royal Army Medical Corps.

Kernick, R. S., electric supply department, Birmingham Corporation.

Kindell, F. P., ASSOC.M.INST.C.E., surveyor's department, Beckenham Urban District Council, 2nd Lieut., 8th London (How.) Brigade R.F.A.

Leece, T. M., electric supply department, Birmingham Corporation.

Lees, H., clerk, water department, Birmingham Corporation, 8th Royal Warwickshire Regiment (Territorials).

Lerew, A. J., clerk to the engineer and surveyor to the Cannock Urban District Council, with the 5th Battalion Oxford and Berks Light Infantry.

[illegible], B. [illegible], engineer's assistant in the Leeds highways department, has joined the London Rifles (Artists' Battalion).

[illegible] W. [illegible], water department, Birmingham Corporation, private, 4th King's Shropshire Light Infantry (Territorials).

[illegible], water department, Birmingham Corporation.

[illegible] J. W. P. [illegible] county [illegible] has joined the 4th Battalion Border Regiment.

[illegible] H. W. [illegible] department, Birmingham Corporation.

[illegible] H. [illegible] Birmingham Corporation.

[illegible], E. [illegible] department, West Hartlepool, joining Durham Royal Garrison Artillery (Territorials).

[illegible] D. R. [illegible] Halifax Corporation, has joined the 4th Battalion, Duke of Wellington's West Riding Regiment.

[illegible], H. [illegible] assistant, surveyor's department, Bushey Urban District Council, with the 2nd London Sanitary Corps. For active service [illegible].

Owen, W. A. E., clerk, water department, Birmingham Corporation, 8th Royal Warwickshire Regiment (Territorials).

Pinnell, G., clerk, Hornsey borough engineer's department, with the Queen's Westminsters.

Pratt, O. S., second assistant, engineer's department, Harrow, with the Public Schools Battalion attached to Middlesex.

Prince, J. W. G., temporary assistant to the county surveyor of Kesteven (Lincs), with the Army Service Corps.

Rogers, M. S., engineering and architectural assistant, Cornwall county surveyor's department, with the Denbighshire Hussar Yeomanry.

Rowcroft, G. A., engineering assistant, water department, Birmingham Corporation, Royal Warwickshire Regiment (City of Birmingham Battalion).

Ruscoe, G. W. O., electric supply department, Birmingham Corporation.

Saunders, G. H., electric supply department, Birmingham Corporation.

Shaw, S. [illegible] supply department, Birmingham Corporation.

Sherren, O. A., surveyor to the Cheriton Urban District Council.

Sinnott, E. S., Lieut.-Col., V.D., county surveyor of Gloucestershire, with the West Midland Territorial Force, at Bath.

Smith, E. C., clerk, water department, Birmingham Corporation, 5th South Staffs Regiment (Territorials).

Smith, L., junior assistant to the county surveyor of Kesteven (Lincs), with the Lincolnshire Yeomanry.

Smith, W. J., clerk, water department, Birmingham Corporation, 8th Royal Warwickshire Regiment (Territorials).

Stanley, F., clerk, water department, Birmingham Corporation, driver, Southern Air Line Signal Company, Royal Engineers (Territorials).

Tamblyn, George, clerk, Cornwall County surveyor's department, with the 5th (Service) Battalion, Duke of Cornwall's Light Infantry.

Todd, I. H., clerk in the Leeds highways department, is serving as a sergeant in the Prince of Wales' Own West Yorkshire Regiment.

Tucker, Halcombe C., Leicestershire County Council staff, has joined the 8th Reserve Cavalry Regiment.

Tuffin, A. E., surveyor's department, Teddington Urban District Council, 8th (Reserve) Battalion Middlesex Regiment.

Turner, E., draughtsman, Hornsey borough engineer's department, with the Royal Army Medical Corps.

Tyler, J. L., clerk, water department, Birmingham Corporation, 8th Royal Warwickshire Regiment (Territorials).

Webster, P. J., electric supply department, Birmingham Corporation.

Webster, T., draughtsman, borough engineer's department, West Hartlepool, with the Army Medical Corps.

Wheeler, P. H., clerk, water department, Birmingham Corporation, Royal Army Medical Corps.

Wilde, F. J., clerk, water department, Birmingham Corporation, Captain, North Midland Division Transport and Supply Column, Army Service Corps (Territorials).

Wilde, H. R., clerk, water department, Birmingham Corporation, Quartermaster-Sergeant, North Midland Division Transport and Supply Column, Army Service Corps (Territorials).

Williams, Ifor, third assistant, surveyor's department, Pontypridd, with the 4th Dragoons.

Wilson, F., draughtsman, borough engineer's department, West Hartlepool, with the Royal Horse Artillery.

Wilson, Percy, divisional county main road surveyor, Cumberland, with B Company, 4th Border Regiment (Territorials).

Wood, D. S. [illegible] supply department, Birmingham Corporation.

Wood, Maurice, assistant to surveyor, Seaford Urban District Council, 2nd Lieutenant, Sussex Fortress Engineers. Has volunteered for foreign service.

A director of the Penmaenmawr and Welsh Granite Company, Limited, Lieut. H. D. Darbishire, of the West Lancashire Howitzer Brigade, and two managing directors of the company, Major A. E. Johnson, of the 4th Battalion, and Captain A. H. Wheeler, of the 6th Battalion, Royal Welsh Fusiliers, together with 100 of the men are away on active service.

THE WAR.

ENLISTMENT BY PROFESSIONAL MEN.

A corps of Royal Engineers, composed mainly of members of the engineering profession, is being established at No. 2 Savoy-hill, W.C. Surveyors and other professional men, with some experience of engineering and similar work, wishing to enlist in this corps should present themselves at the address mentioned. Those wishing to enlist in a professional body, but not having the engineering experience required for the above corps, should apply to the recruiting officer, 20 Hanover-square, W., where Sir Howard Frank has kindly provided offices for this purpose.

LOCAL AUTHORITIES AND THE WAR.

Ten members from the indoor staff of the Beckenham Urban District Council have, together with thirty-three of the outdoor employees, joined either the Army or Navy Force. By resolution of the council, the married men receive full wages, and the single men two-thirds of their wages, less the amount received as active service pay.

We are asked to state that Akonia, Limited, 120-121 Bank Chambers, 329 High Holborn, E.C., is British, and that 96 per cent of its capital is held by British subjects, while the directors, including the managing director, and all the members of the staff, are British born; furthermore, Akonia is entirely produced in England.

The Royal Institute of Public Health is authorised by the War Office to enrol recruits for the Royal Army Medical Corps, who should be between the ages of eighteen and thirty-five. Men possessing special experience, such as is evidenced by sanitary inspectors, chemists (Pharmaceutical), or advanced first-aid certificates, are especially invited to offer themselves. Enlistment for three years or for the war only. Applications, stating age, qualifications, &c., to be addressed to the Secretary, 37, Russell-square, W.C.

Messrs. Herbert Morris, Limited, Loughborough, inform us that over 160 of the staff and men from Empress Works are now serving with the Colours. The organisation of the works has proved amply capable of dealing with this state of affairs, in spite of the fact that orders received during August were well up to the average of the previous twelve months, and in excess of the monthly average of the preceding three years, and no customer has been disappointed in his deliveries. The firm have every confidence in the situation, and although they have very large stocks, they have, during the last month, placed contracts for materials to see them over the next six to nine months. Out of 1,070 accounts due at, or previous to, August 4th, in only six cases of inconsiderable importance has the moratorium been taken advantage of. It is the company's intention, as far as possible, to absorb all hands taken on in place of those who have joined the Colours, who will be reinstated on their return, and plans are being prepared for works extensions, the first contract for which it is hoped to place in about a fortnight.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. J. A. Richmond, of Faversham, to whom the premium for August was awarded, has selected "Road Construction and Maintenance," by Aitken (Griffin & Co.), and a copy of this book has been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:—

417. Sewer Construction.—A sewer is being constructed partly in tunnel. Describe a method of giving the levels in the heading, referring specially to the establishment of the line of levels from the surface. (Ning.)

418. Iron Curved Roof.—Show details of an iron curved roof of 40-ft. span, resting on girders and stanchions on one side, and on a 14-in. brick wall on the other. The roof is to be covered with corrugated iron. Show enlarged details at the foot of the principal rafter at each end. (K. G. F., *Buckfastleigh.*)

423. Sewer Construction.—Show by sketches (plan and section) the junction of a 3-ft. and a 5-ft. brick barrel sewer.

424. Mechanics.—Distinguish between kinetic and potential energy, and show how they are measured in the case of a body falling from rest. Show that, if a body be let fall from rest, its energy remains constant till it reaches the ground.

425. Strength of Materials.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength.

426. Geodesy.—Give a formula for computing the difference in height between two stations by means of the observed heights of the barometer, and state the meanings of the symbols used.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

422. Building Construction. The earth in front of a semi-basement to a house has to be supported for a depth of 6 ft. Give a section of a suitable retaining wall, and prove its stability by a graphic diagram.

A wall of the section shown, 1 ft. 3 in. wide at top, 2 ft. wide at base, with a batter of 1½ in. to the foot on the basement side, will be found suitable. To prove this graphically, it will be necessary to find the horizontal earth pressure at the back of the wall, and also the weight of wall itself, per foot-run.

To find horizontal earth pressure.

By Rankine's formula—

$$P = w H^2 \left(\frac{1 - \sin. \theta}{1 + \sin. \theta}\right)$$

where P = horizontal earth pressure per ft. run in lb.

w = weight of cub. ft. earth (112 lb.)

H = height of wall (6' 0")

θ = angle of repose (say 45°)

It is assumed that the wall is not surcharged.

$$P = \frac{1}{2} \times 112 \times 6 \times 6 \left(\frac{1 - \cdot 7071}{1 + \cdot 7071}\right) \text{lb.}$$

$$= \frac{2016 \times \cdot 2929}{1 \cdot 7071}$$

$$= 345 \cdot 9 \text{ lb.}$$

∴ P = 3·09 cwt. (acting at one-third the height of wall).

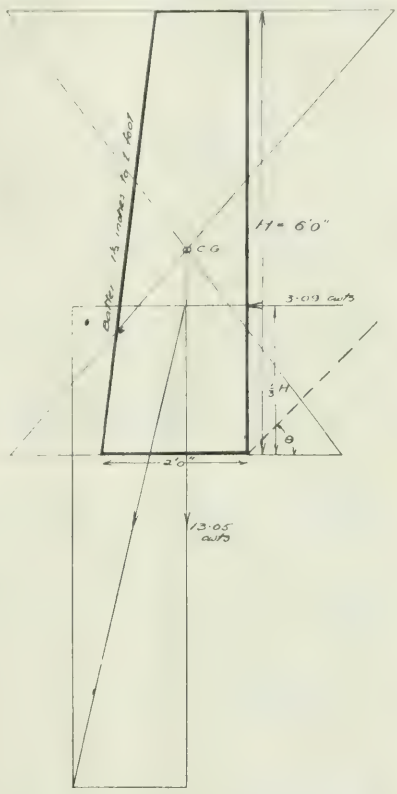
To find weight of wall.

Assume weight per cubic foot as 150 lb.

$$\text{Wt.} = 6' \times 1' 7\tfrac{1}{2}'' \times 1 \times \frac{150}{112} \text{ cwt.}$$

$$= 13 \cdot 05 \text{ cwt. per ft. run of wall.}$$

Then, by the parallelogram of forces the resultant thrust is found to pass through the base just 8 in. from the outer edge—*i.e.*, on the end of the middle



third. But as it is well known that Rankine's formula is 20 per cent. to 30 per cent. on the safe side, it is quite safe to assume that the wall is sufficiently strong. (G. H. G. S., *Hebden Bridge.*)

Manchester Municipal Employees and the War.—The officials and workpeople of the Manchester Corporation, numbering about 20,000, have resolved to impose a charge upon themselves in aid of the National Relief Fund to the extent of £500 a week. In the tramways department alone, within forty-eight hours, upward of 3,000 workers had authorised deductions to be made from their wages.

Storm-Water Drainage at Stretford.—The work of constructing a system of storm-water sewers in Stretford, Lancs., commenced in April last, is rapidly approaching completion. The scheme comprises about 1 mile of deep sewer formed of reinforced-concrete tubes, varying in diameter from 36 in. to 45 in., and the chambers for access, inspection and contingent work. The sewer is laid in headings from shaft to shaft in Chester-road, running parallel with and at a lower plane than the main sewer, which it is intended to supplement. The scheme was devised by the council's surveyor, Mr. E. Worrall, F.S.I., and approved, without alteration, by the engineering department of the Local Government Board, who subsequently sanctioned a loan to meet the cost of the work. Tenders were invited, and that of Messrs. Edmund Nuttall & Co., Trafford Park, was accepted.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Abersychan U.D.C. (September 10th. Mr. A. G. Dixon). This was an application for permission to borrow money for the construction of new roads at Pontnewynydd and Pwllygrifiad, and for the improvement of the road and railway and river bridges at Cwmavon, including the execution of works in the Blaenavon Urban District. The application was made in order that works may be undertaken should the ratepayers decide to make provision for any unemployment occasioned by the war. It was stated that the County Main Roads and Bridges Committee had agreed to pay one-third of the net cost of the three schemes, which amounted to £9,150.

Bangor (Co. Down) U.D.C. (September 17th. Mr. P. C. Cowan).—£500 for providing bathing accommodation at Ballyholme, £550 for the purchase of water meters, £500 for providing bowling green, £2,700 for laying out Stricklands Glen as a park, £1,610 for the completion of Ward Park, £600 for widening Seacliff-road, £860 for the purchase of a steam tractor and two wagons, £1,550 for providing public conveniences at Clifton and Marine Gardens, and £1,480 for the purchase of a motor fire engine.—Evidence was given in reference to the various applications by, among others, Mr. H. C. Bell, surveyor.

Batley T.C. (September 9th. Mr. W. O. E. Meade-King).—£2,400 for the purpose of diverting and culverting the beck running through the lower portion of Wilton Park.—The town clerk, Mr. T. H. Craik, asked for as lengthy a period as the board could allow for the repayment of the proposed loan. It was intended to level up the site comprising the lower portion of the park in order that it might be laid out for recreation purposes. The borough surveyor, Mr. O. J. Kirby, gave estimates and details of the proposed works.

Belfast T.C. (September 15th. Mr. P. C. Cowan).—£6,000 for the extension of the Purdysburn fever hospital, £36,117 for erecting working-class lodging-houses, and £10,600 for extending the Purdysburn lunatic asylum.—Evidence was given by Mr. John Mackenzie (Young & Mackenzie) in regard to the infectious diseases hospital, and by Mr. N. Fitzsimmons (Watt, Tulloch & Fitzsimmons) in regard to the asylum buildings. With respect to the proposed loan of £36,117, the town clerk said the amount was made up as follows: The contract for the houses was £30,504, this being for 252 three-roomed houses. There were also some additional works, such as the erection of walls, completing of yards, and providing of spaces in front and rear of buildings. For this the city engineer, Mr. H. A. Cutler, estimated an expenditure of £3,538, and then, for contingencies and miscellaneous expenditure, there was an item of £2,073 15s. The city surveyor explained the proposed works in detail.

Chippenham T.C. (September 17th. Mr. A. W. Brightmore).—£1,500 for purposes of water supply.—The town clerk, Mr. J. W. L. Cooper, stated that the water supply of Chippenham was from an artesian well, and that for a long time there were great complaints as to the discoloration of the water, which was found to be largely attributable to iron. The council had decided to instal two filters and aërators, and it was to defray the cost of installation that the council wished to take up the loan. There was no opposition to the application.

APPLICATIONS FOR LOANS.

Beaconsfield U.D.C.—£9,600 for the provision of forty workmen's dwellings.

Brigg R.D.C.—£5,000 for workmen's dwellings.

Clitheroe T.C.—£2,800 for the Littlemore road improvement.

Dover T.C.—£30,000 for new cottages in the Pier district.

Glamorgan C.C.—£4,140 for erection of school buildings at Bryncethin; £6,565 for similar buildings at Clydach.

Southend T.C.—£5,985 for the making up and sewering of various roads.

Weobley (Hereford) R.D.C.—£1,200 for hospital purposes.

Worcestershire C.C.—£3,600 for new police buildings at Droitwich.

LOANS SANCTIONED.

Barnsley T.C.—£2,005 for new open-air school at Mount Vernon.

Brighton T.C.—£1,967 for alterations and additions to Middle-street council school.

Buckinghamshire C.C.—£1,795 for the enlargement of the Wolverton county secondary school.

Great Harwood T.C.—£2,100 for street improvement works in Heys lane and Water-street.

Llandilo R.D.C.—£1,500 towards the erection of Rhydymerdy bridge.

Luton T.C.—£6,000 towards the cost of erecting a new footbridge over the railway.

Mytholmroyd U.D.C.—£1,000 for the extension of water mains.

Preston T.C.—£2,400 for the purchase of two motor fire engines.

Ruislip-Northwood U.D.C.—£4,550 for the making up of Hillhard, Kewferry and Dene roads.

Southend T.C.—£16,000 for resurfacing and improving the main road from Hadleigh to Bournes Green.

Upton R.D.C.—£5,610 for water supply.

West Bridgford U.D.C.—£600 for the extension of the public offices.

FORTHCOMING INQUIRIES.

SEPTEMBER.

		£
28.	**Reading.** For construction of sanitary convenience and for road widening and improvement	7,180
29.—	**Birmingham.** For purchase of the Woodville estate for the extension of Selly Park (Mr. R. H. Bicknell)	1,818
29.—	**Bradford.** For purchase of lands for public pleasure grounds (Mr. M. K. North)	7,500
29.—	**Hamsey.** For sewerage and sewage disposal purposes (Mr. P. M. Crosthwaite)	1,300
29.—	**Macclesfield.** For works of sewage disposal (Mr. F. O. Stanford)	9,874
29.	**Stourbridge.** For purchase of Studley Court estate for purposes of a public park (Mr. R. H. Bicknell)	8,500
29.—	**Warrington.** For acquisition of site for extension of Great Sankey smallpox hospital (Dr. Miles B. Arnold)	—
30.—	**Chipping Sodbury.** For purchase and development of Bury Hill quarry (Major J. Stewart)	545
30.—	**Kiveton Park.** For sewage disposal purposes for the parish of Wales (Mr. A. W. Brightmore)	3,200
30.—	**Turton.** For electricity works purposes (Mr. T. C. Ekin)	3,569

OCTOBER.

1.—	**Bolton-upon-Dearne.** For the purchase of land and erection of working-class dwellings (Mr. C. H. Eyles)	71,000
1.—	**Newbury.** For extension and improvement of cattle market (Mr. T. C. Ekin)	1,100
1.—	**Sheffield.** For purposes of public sanitary conveniences, works of sewerage, and road widening and improvement (Mr. F. O. Stanford)	5,295
2.—	**Barking Town.** For the purchase and fencing of land for purposes of open space, and for road widening and improvement (Major J. Stewart) ...	9,520
2.—	**Lancaster.** For provision of sanitary conveniences (Mr. A. W. Brightmore)	1,680
6.—	**Ealing.** For erection of working-class dwellings (Mr. C. H. Eyles)	5,500

Town Planning at Esher and the Dittons.—On Saturday last Mr. Thomas Adams held a Local Government Board inquiry as to the application of the Esher and the Dittons Urban District Council to prepare a town planning scheme, comprising an area of 1,645 acres. Mr. H. C. Fread, engineer and surveyor to the council (who had prepared the map of the scheme), was among those who gave evidence.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Kirkintilloch, York £6,851; housing and town planning—Acton £80,000, Mansfield £7,000, Sunderland; roads and materials—Bethnal Green, Durham £100,000, Lancashire, Oxford £43,000, Worcestershire £29,457; sewerage and sewage disposal—Barrow-on-Soar £15,000, Beverley £10,000; water, gas and electricity—Woolwich £10,000. Particulars of other works projected will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Blackpool T.C.—The provision of baths at the corner of Bloomfield-road and Central Drive is under consideration.

Derbyshire C.C.—The Education Committee on Tuesday accepted tenders of £9,060 and £3,654 respectively for the erection of new council schools at Borrowash and Bugsworth. In the case of Borrowash £2,187 is included for the provision of a cookery and manual instruction centre, but this portion of the scheme may not be proceeded with.—Tenders are to be obtained for the erection of a new school on a site between Chinley and Bugsworth.

Hastings T.C.—The rebuilding of the sea wall at the Marine Parade is to be carried out at a cost of £3,755.

Kirkintilloch T.C.—The burgh surveyor has prepared plans for public baths. One scheme, providing a swimming pond, 70 ft. by 35 ft., works out at £8,000, and an alternative scheme, giving a pond 60 ft. by 30 ft., would cost £5,250, exclusive of furnishing and professional fees. The council have asked for a report as to a cheaper scheme.

Margam U.D.C.—The widening of the bridge between Port Talbot and Tondu, at an estimated cost of £1,400, has been decided upon.

Nottingham T.C.—A suggestion to build a combined branch library and baths at Carrington is engaging the attention of the corporation.

Wolverhampton T.C.—The tender of Mr. W. Roe, at £3,165, has been accepted for the erection of firemen's dwellings.

York T.C.—Twenty-eight cottages are to be erected for the accommodation of tramway workmen. The cost is estimated at £6,851.

HOUSING AND TOWN PLANNING.

Acton U.D.C.—A report states that a scheme of workmen's dwellings, estimated to cost £80,000, is about to be put in hand.

Blaydon U.D.C.—A scheme for the erection of 400 working-class dwellings is in course of preparation.

Mansfield T.C.—The Health Committee have resolved to submit a proposal to the Local Government Board for the erection of forty houses in Baum's-lane, at an estimated cost of £7,000.

Middleton T.C.—It is proposed to build about twenty-four houses on the Boarshaw estate. The cost is estimated at about £5,000.

Portland U.D.C.—It is recommended that the council should apply to the Local Government Board for sanction to borrow £1,390 for workmen's dwellings.

Ruislip-Northwood U.D.C.—The Public Health Committee have been authorised to submit a scheme for the erection of twenty-two houses at Ruislip Common.

Sunderland R.D.C.—The council have applied to the Local Government Board for sanction to purchase 5½ acres of land at Burdon-lane, Ryhope, from the Ecclesiastical Commissioners, at a cost of £2,550, for working-class dwellings. About eighty houses are to be erected at an average cost of £222 each.

Swinton and Pendlebury U.D.C.—The erection of forty houses in Warwick-street, at an estimated cost of £7,900, is proposed.

Tilbury U.D.C.—As regards the scheme of housing in the North Ward, the Local Government Board state they will not be prepared to give their sanction to the loan until satisfactory arrangements can be made for the disposal of surface water and sewerage. With respect to the scheme of housing in the South Ward, the board suggests that 150 houses should be erected in the first place, divided as follows—viz., 88 houses, Class I.; 12 houses, Class II.; 50 houses, Class III. The board have arranged to sanction the purchase of 12 acres of land, in addition to the land at present vested in the council. The board further suggest that in any future part of the scheme the council should endeavour to provide some three-bedroomed houses of a less expensive type.

Uxbridge U.D.C.—It has been resolved to purchase 5 acres of land at Harefield for the purposes of a housing scheme.

PARKS AND OPEN SPACES.

Hoylake and West Kirby U.D.C.—The levelling of the upper grounds of West Kirby Park is to be carried out at a cost of £600.

Hyde T.C.—Approval has been given to proposals to spend over £3,000 upon schemes for providing a lake in the park for boating, the provision of hard tennis grounds, levelling land at Flowery Field, improvements near the Lodge-lane entrance to the park, making an additional entrance to the park, and park improvements.

Prestatyn U.D.C.—The Local Government Board have sanctioned a scheme for the purchase of a plot of land on the hillside—one of the chief attractions of the town—for the purposes of a recreation and pleasure ground. The price of the purchase is £300.

Stanley (Durham) U.D.C.—A sum of £3,000 is to be expended on the purchase and laying out of Shield Row Wood as a public park.

REFUSE COLLECTION AND DISPOSAL.

Westbourne R.D.C.—A letter having been received from the Local Government Board stating that, unless the council proceeded with the scavenging in Bosham and Westbourne forthwith an inquiry would be instituted by one of the board's inspectors with a view to enable them to determine whether they should issue an order requiring the council to undertake the work, the council have decided to deal with the matter at once.

ROADS AND MATERIALS.

Annfield Plain U.D.C.—Tenders for the carrying out of private street works are to be obtained.

Barnsley T.C.—It has been agreed to make up Race-street by direct labour.

Bethnal Green B.C.—The borough surveyor, Mr. A. E. Darby, has interviewed the engineer to the Road Board, with the result that the latter provisionally promised that the Road Board would contribute the full amount overspent by the council on highways works approved by the board, if the total expenditure on highways for the year ending March 31, 1915, exceeds the amount of £14,741, provisionally estimated for normal works. A scheme has been submitted referring to special paving works which can be undertaken after the expedited normal works have been executed, provided the cost of such special works is borne by the Road Board. The scheme of special paving works relates to Brick-lane, Church-street, Globe-road, Green-street, Cyprus-street, Temple-street, Treadway-street, and Vyner-street, the total estimated being £9,583. The Emergency Committee have authorised the borough surveyor to submit this to the Road Board for approval, and it is understood that the sanction of the Road Board will probably be obtained at an early date.

Birstall U.D.C.—The tender of Messrs. J. Akeroyd & Son, at £758, has been accepted for making up North-terrace.

Bristol T.C.—The city engineer, Mr. L. S. McKenzie, reported recently to the Sanitary Committee that, as regarded two schemes of road widening—namely, Avonmouth-road and Filton-road—the engineer to the Road Board said that as these works involved a considerable amount of labour he considered them very suitable for the relief of distress should there be any. He suggested that the Avonmouth-road widening was

[illegible] of the two schemes, and that if the corporation would undertake not to put any of the work in hand until instructions were given by the Road Board, the Board would grant £1,000 towards the cost of the work, the estimate being £3,592, of which [illegible] was for purchase of land. If there was need for further work being found, he undertook, on the [illegible] to recommend a grant of £1,000 [illegible] the Road Board considering the estimate [illegible] of the purchase of land [illegible]

Cornwall C.C.—The purchase of certain road-making plant has been decided upon by the Highways Committee.

Daventry R.D.C.—The purchase of a road roller has been decided upon.

Dover T.C.—The council have been recommended to carry out certain [illegible] on the Folkestone road [illegible] £1,000.

Droitwich T.C.—The work of constructing in tar-macadam the [illegible] road through [illegible] has been approved by the Road Board.

Durham T.C.—Approval has been given by representatives of the Durham County Council, the West Hartlepool Town Council, and the Easington Rural District Council to a scheme for a new road through the colliery district of East Durham, and a deputation will be sent to the Road Board to make application [illegible] The cost of the work is estimated at from [illegible] £100,000.

Easington R.D.C.—The clerk, Mr. J. Morley Longden, recently made a statement with regard to the proposed new coast road through the new colliery district of East Durham. He said representatives of the Durham County Council, the West Hartlepool Town Council, and the Easington Rural District Council had met and fully discussed the scheme, and approved it. The three authorities had decided to send a deputation to the Road Board and inform them that the application for a grant was a joint one from the Easington Council and the West Hartlepool Corporation, with the entire approval of the County Council. As between these authorities, the suggestion was that, after a contribution from the Road Board, each should bear 33⅓ per cent of the remaining cost, provided that the contribution from the Road Board was sufficiently substantial. It is estimated that the road will cost from £80,000 to £100,000.

Hastings T.C.—It has been decided by the town council to take up loans of £831 and £4,890 for repairing, kerbing, &c., in Battle-road, and for the wood paving of Robertson-street and part of Front Line.

Hayward's Heath U.D.C.—The council have approved the estimate of the surveyor, Mr. G. Plummer, at £1,295, for making up the remaining portion of Western-road under the Private Street Works Act.

Huntly T.C.—It has been agreed to treat part of Bogie-street with Rocmac upon a proper foundation.

Jarrow T.C.—It is proposed to carry out the Field-terrace improvement, at an estimated cost of £5,200, and to ask for a grant in aid of the work from the Road Board.

Kingston (Surrey) T.C.—Owing to their inability to supply Quenast granite in consequence of the war, the contractors have been allowed to substitute Welsh granite.

Lancashire C.C.—The County Main Roads and Bridges Committee have confirmed schemes for carrying out various road improvements. The Road Board have sanctioned the proposed works, and will give a grant of £45,000 towards them. The largest individual piece of work is the construction of an entirely new road between Blackpool and Poulton, at a cost of £26,000, towards which the Road Board will contribute £20,000.

Margam U.D.C.—The widening of the road from Bryn to Maesteg, at an estimated cost of £2,500, has been decided upon. The council are prepared to go on with a new road up the Avon Valley. Approval to this work—which is estimated to cost £14,180—has already been given by the Glamorgan County Council.

Oxford T.C.—Application has been made to the Road Board for a grant towards the reconstruction of the main thoroughfares of the city. The city engineer, Mr. W. H. White, estimates the cost of laying a solid foundation to the streets and resurfacing with tar-macadam at about £43,000.

Prestatyn U.D.C.—With the view of expediting the work and at the same time providing employment at a time when it is much needed, the Local Government Board have informed the Prestatyn Urban District Council of their willingness to sanction a loan of £1,700 for road improvements in the district. A scheme has been adopted for widening and otherwise improving Meliden-road and Ffordd las, and further improvements are under consideration.

Preston T.C.—The borrowing of £6,075 for the improvement of Glover's Court is recommended.

Romford R.D.C.—A scheme for the widening of Stevenson's Hill, Hornchurch, at a cost of £1,332 was [illegible] the consent of the land owners, and it was agreed to forward it to the county council with a recommendation for its adoption.

St. Austell U.D.C.—Mr. E. D. Groves, the engineer and surveyor, has been instructed to carry out departmentally street improvements at East-hill (estimated cost £[illegible]), High-street (£[illegible]), Westbourne (£100) and Carvath (£[illegible]).

Shanklin U.D.C.—The surveyor, Mr. E. C. Cooper, has been asked to prepare a scheme for laying out and developing Miller's Green on the Esplanade.

Westhampnett R.D.C.—Application is to be made to the Road Board for a grant for improving the Upper Bognor-road with granite from the Chichester city boundary to a point about 300 yds. north of the Oak Inn, at North Bersted, in accordance with the estimate prepared by the surveyor of the lower district, amounting to £2,638. The surveyor of the lower district has been directed to prepare an estimate and specification for surfacing the direct Chichester to Selsey road with granite with the view to submitting an application to the Road Board for a grant for executing the proposed work.

Woolwich B.C.—Application is to be made to the London County Council for the balance of a loan of £10,295 for improvements in the streets portion of the borough.

Worcestershire C.C.—The Road Board have intimated their willingness to approve, provisionally, additional road improvement works at a cost £29,457.

Yeovil T.C.—The making up of Rosebery-avenue has been decided upon.

SEWERAGE AND SEWAGE DISPOSAL.

Baldock U.D.C.—The Local Government Board have sanctioned the sewerage scheme as generally satisfactory, but suggest certain alterations, as to which it was agreed that the surveyor, Mr. P. Kent, should interview an engineering inspector at Whitehall.

Barrow-on-Soar R.D.C.—A proposal to carry out a scheme of sewerage and sewage disposal at Rothley was discussed at some length at Tuesday's meeting. Ultimately it was decided to apply to the Local Government Board for a loan of £15,000, the estimated cost of the work.

Beverley R.D.C.—Tenders are to be obtained for the carrying out of a drainage scheme estimated to cost £10,000.

Brighton T.C.—It is proposed to expend a sum of £2,000 on the provision of additional lavatory accommodation.

Camborne U.D.C.—Amended plans and specifications have been approved of a sewerage scheme, estimated to cost £22,429, and the tender of Mr. A. Carkeek, of Redruth, has been accepted for the work.

Clones U.D.C.—Works of drainage are to be carried out at a cost of £2,700, and Mr. Weaver, of Gloucester, the consulting engineer, has been instructed to invite tenders.

Royston U.D.C.—Tenders are to be obtained for alterations to the sewers in accordance with the report of Mr. Midgley Taylor, M.INST.C.E.

WATER, GAS, AND ELECTRICITY.

Belfast T.C.—The report of a sub-committee appointed to deal with the electricity undertaking came before the Tramways Committee on Monday. The sub-committee reported that they had considered and recommended the reports of Sir John Snell, M.INST.C.E., and Mr. W. J. Pratten, M.I.MUN.E., the consulting experts, in respect of the erection of a new

station on a site to be obtained from the Harbour Commissioners. The committee endorsed the reports and recommendation to the corporation. Sir John Snell emphatically advises the corporation on no account to remodel or extend the present station, but to proceed at once with a second power-house, more favourably and economically situated. He proposes the purchase of one 3,000-k.w. turbo-alternator, surface condenser and pumps without delay, together with one more 1,000-k.w. rotary converter, which, with a rotary now on order, would be the two first rotary converters sets to be fixed at the East Bridge-street station. The total estimated cost of this work will be, approximately, £48,000. Mr. Pratten agrees with Sir John Snell that there is no other course but to build and equip a new station.

Glasgow T.C.—It has been agreed that application be made to Parliament for power to increase the city's sources of water supply, and that permission be given for the purpose of (1) re-submitting to Parliament the Loch Voil scheme, either alone or in conjunction with the river Turk scheme, or (2) submitting schemes for utilising the waters of the river Turk and the river Duchray without Loch Voil, as may be determined after the engineers have submitted their report.

Hastings T.C.—A sum of £2,444 is to be borrowed for the provision of new water mains; a loan of £5,000 for new electricity mains is also to be applied for.

Horsham R.D.C.—The services of a consulting engineer are to be obtained in connection with the provision of a water supply for Broadbridge Heath and Warnham.

Norman Cross R.D.C.—Tenders are to be obtained by the surveyor for boring in connection with a water supply scheme for Orton Waterville.

Northwich R.D.C.—Consideration is to be given by the council to a comprehensive scheme for a water supply for the Barnton and Winnington districts.

Okehampton R.D.C.—An improvement of the water supply of the parish of Chagford has been decided upon.

Thorne (Yorks) R.D.C.—The question of the water supply of Stainforth is receiving the consideration of the council.

Wolverhampton T.C.—The tender of the Davenport Engineering Company, at £2,620, has been accepted for the supply and erection of water cooling towers at the generating station.—It has also been agreed to accept the tender of Willans & Robinson, Limited, of Rugby, at £2,500, for the reconstruction of the 2,000-k.w. alternator at the electricity works.

Woolwich B.C.—An expenditure of £10,000 on new machinery in connection with the electricity undertaking is proposed.

MISCELLANEOUS.

Blaydon U.D.C.—A steam motor wagon is to be purchased at a cost of £200.

Carlisle T.C.—The city surveyor, Mr. H. C. Marks, has been instructed to inquire and report as to what sites in the city are available for cultivation as allotment gardens by men who may be wholly or partially unemployed in consequence of the war.

Cheltenham T.C.—The work of providing pumps and piping to give a supply of mineral water to the United Chemists' Association is to be put in hand forthwith.

Kingston (Surrey) T.C.—Four tenders have been received for providing and laying flooring for the swimming bath, removing it at the end of the season and replacing it at the opening of the succeeding season, and a committee recommend the acceptance of the lowest tender—that of Messrs. Limpus & Son, at £200.

Portland U.D.C.—Tenders are to be obtained for the supply of a tractor and wagon.

Stamford T.C.—Having been asked by the Kesteven county surveyor, Mr. W. B. Purser, to suggest any works that could be carried out in the Stamford district by unskilled labour, the council have suggested the cleaning out of the river Welland, a new road to be made from St. Paul's-street to Conduit-road, in accordance with a plan prepared by the borough surveyor, Mr. T. F. R. Ryman, the widening of Star-lane, as shown by the plan of the borough surveyor, and the making of a public convenience in the borough.

PERSONAL.

Mr. H. Stringfellow has been appointed highway surveyor to the Emsworth Rural District Council, at a salary of £80.

Mr. Thomas W. Morgan, assistant surveyor, Carmarthenshire, has been appointed divisional surveyor to the West Suffolk County Council.

Mr. J. W. Kirsopp, highways surveyor to the Carlisle Rural District Council, has been supplied by the council with a motor cycle at a cost of £62.

Mr. Oscar L. Cole, second assistant to the borough surveyor of Guildford, has been appointed an assistant in the office of the borough surveyor of Swansea.

Mr. P. C. Woodhall, engineer and surveyor to the Blandford Corporation, has been appointed surveyor and sanitary inspector to the Ottery Urban District Council.

Mr. S. A. Hill-Willis, surveyor to the Tilbury Urban District Council, has been granted an increase of salary from £248 to £328 per annum, by four increments of £20.

Mr. H. M. Enderby, pupil to Mr. R. H. Jenkins, surveyor to the Skegness Urban District Council, has been appointed temporary assistant in the Aylesbury surveyor's office.

Mr. P. C. Smith, burgh engineer of Arbroath, has been appointed burgh engineer of Dunfermline, in succession to Mr. William R. Maxwell, whose resignation was reported in our issue of the 11th inst.

Mr. R. Curtis Cordon, surveyor to the Hereford Rural District Council, has been appointed surveyor to the Bucklow Rural District Council, at a commencing salary of £175 per annum, rising to £200, with allowances of £65 for travelling and provision of office. Mr. Cordon has held his position at Hereford for sixteen months. Previously, for two years, he was surveyor to the Buckingham Rural District Council, and assistant surveyor for 4½ years to the Belper (Derby) Rural District Council. His many friends will be pleased to hear of his success at Bucklow, Cheshire.

Mr. H. Percy Boulnois, M.INST.C.E., well known to all municipal engineers, has his two sons fighting for the country, one of them in command of a submarine in the North Sea, the other a Lieutenant of the Royal Engineers, who is at the front, and who was at the battle of Mons and is now under fire in the big battles that are raging in France. Both Mr. Boulnois' sons-in-law are barristers, but they have joined the Forces. One of them is a Captain in the 4th Berks Regiment, which has volunteered for foreign service, and the other has joined the Inns of Court Officers Training Corps. From what we know of Mr. Boulnois we feel sure that had he been a younger man he would have enlisted himself, and he would thus have had the satisfaction of feeling that all the male members of his family were doing their duty during this great crisis.

Mr. J. C. Midgley, a paper by whom on the problems of Newcastle-on-Tyne in connection with housing and town planning appeared in our last issue, is a native of that city, and has been in the service of the corporation for many years, having, after serving his pupilage as a surveyor, commenced service with the town council as a general engineering assistant. When the tramways were relaid in 1901-3 on the adoption of the overhead trolley system in place of horse cars, he acted as assistant resident engineer for the track. He afterwards acted as resident engineer for the track for several tramway extensions, and in a similar capacity for many important works of town improvement. In 1906 he was appointed central district surveyor, with administrative charge of roads, streets and sewers. Four years later he became deputy town surveyor. The work includes the supervision of the building inspection department, also the supervision and control—under the city engineer, Mr. W. J. Steele, M.INST.C.E., who is also town surveyor—of the erection of, and alterations to, all buildings, and the laying out of new building estates in the city, in addition to dealing with dangerous structures; all surveyor's work under the Factory and Workshops Act and the Public Health Acts, the preparation of town planning schemes in connection with, and all surveyor's work under, the Housing and Town Planning Act of 1909.

Permission has already been obtained from the Local Government Board for the purchase of [illegible] at a cost of [illegible] and at the north end of the city for

Mr. J. C. Midgley,
Deputy Town Surveyor, Newcastle-on-Tyne.

about 52½ acres, known as Craghall Dene area, and the other at the east end of the city for about 1,265 acres.

Warwickshire's Roads.—On Wednesday, at a meeting of Foleshill Rural District Council, there was a discussion regarding Bedworth main roads, and the members representing that town spoke highly of the work which the Warwickshire county surveyor (Mr. John Willmot) had put into them, during late months especially. One member said their condition was better now than it had been for fifty years past.

Manchester Town Planning Scheme.—On Wednesday Mr. George L. Pepler, Local Government Board inspector, held an inquiry at Manchester concerning the city council's application for authority to prepare a town planning scheme for an area on the southern side of Manchester. The scheme deals with unbuilt land, wholly within the city boundary, and includes Rusholme, Levenshulme, Gorton, Chorlton-cum-Hardy, Withington, and Didsbury. Mr. T. de Courcy Meade, M.Inst.C.E., the city surveyor, was among those who gave evidence in support of the application.

Wallsend's New Secondary School and Technical Institute.—The opening of a new secondary school and technical institute erected at Wallsend by the Northumberland County Council took place on Wednesday. The building is of attractive design in the English Renaissance style, and brick, with stone and terra-cotta facings, has been used throughout. On the ground floor there are eight large classrooms, assembly hall, gymnasium, and domestic science and mechanical departments, with a boiler-house adjoining. On the first floor there are chemical and physical laboratories with adjacent lecture rooms. The second floor is occupied by art and mechanical drawing rooms, with rooms for the staff and the offices. In a separate block there are dining-rooms for the students, manual instruction rooms, and caretaker's house.

Poole Water Scheme.—Poole Town Council held a special meeting last Friday to consider the preliminary steps for the development of their waterworks undertaking, involving, if carried out, an expenditure approaching £30,000. One feature was as to the employment of Mr. A. P. I. Cotterell, to supervise works (if so determined upon) he had recommended (apart from a £450 scheme for gas producer plant and junction main already carried out)—viz., additional pumping machinery and buildings, £8,700; additional service reservoir, with connections to rising and leading mains, £14,340; contingencies, £2,350; engineering, clerks of works, legal expenses, and cost of land, £3,000. After discussion, it was agreed that the question of the provision of a reservoir should be deferred, and that steps should be taken to provide such additional pumping capacity as may be necessary.

FOR OTHER ADVERTISEMENTS
See End of Paper.

FRIERN BARNET URBAN DISTRICT COUNCIL.

ENGINEER AND SURVEYOR'S ASSISTANT

A temporary vacancy occurs in the Engineer and Surveyor's Department owing to the War, and an Assistant is required with a good practical knowledge of Surveying, Levelling, Building Construction, Draughtsmanship, and Municipal Works.

Apply, giving full particulars and stating salary required, and when duties could be commenced.

(By order)

E. J. REYNOLDS,
Engineer and Surveyor.

Council Offices,
The Priory,
Friern Barnet-road, N.
September 23, 1914 (1,956)

WANTED, in a Borough Engineer's office in London, two Temporary Draughtsmen. Salary 35s. per week each.—Applications, stating age and experience, with copies of three recent testimonials, to be sent to Box 139, c/o Messrs. R. F. White & Son, General Advertising Agents, 33 Fleet-street, E.C. (1,959)

THE SHIPLEY URBAN DISTRICT COUNCIL invite offers for about 160 tons Old Steel Tram Rails, Fishplates, Tie Bars, &c., on their Bradford-road Tramway Track, recently relaid. Tenders, stating the price per ton for the material where at present laid, to be sent in not later than Tuesday, September 29th, 1914, endorsed "Old Tram Rails."

I. LINDOW,
Clerk to the Council.

Council Offices, Shipley, Yorks.
September 17, 1914. (1,957)

TO ASPHALTE CONTRACTORS.

The Battersea Borough Council invite Tenders for the Supply of Materials and Works for Resurfacing Roadways with Asphalt-macadam. Specification and Form of Tender may be obtained from the undersigned.

Tenders, endorsed "Asphalt," must be delivered by noon on Monday, 5th October, 1914.

W. MARCUS WILKINS,
Town Clerk.

Town Hall,
Battersea.
September, 1914. (1,961)

COUNTY BOROUGH OF SOUTHEND-ON-SEA.

TO IRON PIPE FOUNDERS.

The Corporation of Southend-on-Sea is prepared to receive Tenders for the Supply of approximately 200 tons of 8-in. diameter Cast-iron Spigot and Socket Pipes.

Particulars may be obtained on application to Mr. Ernest J. Elford, M.Inst.C.E., Borough Engineer, Municipal Buildings, Southend-on-Sea, on and after Thursday, the 24th inst., on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents.

Sealed Tenders, endorsed "Tender for Cast-iron Pipes," to be delivered at the office of the undersigned not later than 9 a.m. on Thursday, the 8th October, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)

H. J. WORWOOD,
Town Clerk.

Town Clerk's Office,
Southend-on-Sea.
September 23, 1914. (1,960)

JUNIOR ASSISTANT (20) desires appointment in Office of Surveyor, for wider experience. Just completed 3 years as Articled Pupil. Small salary for good opening.—Box 1,471, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (1,958)

The Cleethorpes New Sewerage Scheme and Outfall Works.

BY JOHN S. ALLORD, M.INST.C.E.

[illegible] Mr. Wrighton, the surveyor, from whom, and from Mr. Pye, the deputy surveyor, he has received much assistance from time to time in connection with the works.

[illegible] of Cleethorpes [illegible] the development of the seaside resort industry, and the growth of population [illegible] the last [illegible].

[illegible] arrangements for the conveyance and disposal of the sewage and storm water required completely overhauled, as a result of the increase in population.

The original system, about to be superseded, dates in its present form, from about 1894, when the southern outfall was extended. The main sewers are of an earlier date. The sewage and storm water are collected by two systems of sewers, one serving the northern part of the district, having an outfall on the foreshore near the northern urban district boundary, and the other serving the southern part, which discharges on the foreshore at the southern end of the district. Both of these outfalls have a continuous discharge when the level of the sea allows, and both deliver at unsuitable places. The northern outfall delivers about 200 yds. inside low-water mark, and the southern outfall at about 300 yds. inside low-water mark.

Although neither of these points of outfall is satisfactory for an uncontrolled discharge, the resulting inconvenience was negligible with the small population which previously existed. The increase of population, the larger area of paved surfaces, and the necessity of extending the sewerage system beyond the possible gravitation limits of the old sewers rendered a new main sewerage scheme imperative. In 1908 the council applied to the Local Government Board for sanction to a loan for new works, but the board rejected the scheme on the grounds that the sewers were not large enough, the capacities of the new pumping stations were insufficient, and the method of pumping unsatisfactory. The author's partner, the late Mr. George Chatterton, then became associated with the scheme, and the works now approaching completion have been designed and constructed under the direction of the author's firm.

The urban district of Cleethorpes may be divided, for present purposes, into three areas: (1) The northern portion, which is flat and at a level of about +11·0 ordnance datum, is considerably built upon; (2) the central area, which is a hill of boulder clay rising to about +40·00 ordnance datum, and is considerably built upon; (3) the southern area, which is flat, parts being as low as +9·00 ordnance datum, this area is to a large extent undeveloped. The levels of the greater part of the district are such that a discharge into the sea by gravitation at a suitable point is out of the question.

The new point of outfall at low-water mark, at the southern end of the district, was indicated by general considerations to be one which would probably be suitable, and this has been confirmed by float observations. The question of the conveyance and pumping of the sewage in the most economical way was fully investigated, with the result that it was found preferable to have two pumping stations. These were required to be nearly 2 miles apart. About 300-horse power, including standby and auxiliary machinery, are required at each station, and it was considered undesirable to work the two stations from a central power-house, for reasons which will probably not be questioned.

The new main sewer commences at the northern end of the district and flows southward, along Grimsby-road, to a pumping station in Poplar-road, where, together with the sewage of the northern slope of the central hill, its contents will be pumped through a rising main 33 in. in diameter to the top of the hill. The lift is about 44 ft. From this point a new sewer has been constructed, extending to the southern end of the district, and which receives the sewage of the southern area along its course. At the southern boundary the sewage is lifted about 22 ft. (minimum) into a storage tank of 1,000,000 gallons capacity, and will be intermittently discharged into the sea at low-water mark.

The northern intercepting sewer varies from 15 in. diameter to 2 ft. 6 in. by 3 ft. 9 in. oval. It is constructed partly on piled foundations. The Poplar-road pumping station will contain two reciprocating pumps, being a duplicate provision for the dry-weather flow with a certain margin, and three centrifugal pumps, being two for the estimated volume and one standby for the storm water.

The southern intercepting sewer at its upper end is 2 ft. 4 in. by 3 ft. 6 in. oval, and 3 ft. 2 in. by 4 ft. 9 in. oval at the pumping station. Portions of this sewer also had to be constructed on piled foundations. The plant at the outfall pumping station is similar in character to that at the Poplar-road pumping station, but of greater capacity. The greater quantity to be pumped so nearly balances the less lift that engines of similar power will be installed in both cases.

The flat portions of the district have a subsoil of warp or estuarial silt of a variable depth, superimposed on boulder clay. The existence of this warp has made the new sewers expensive relatively to their length.

At the pumping stations the principle has been adopted of putting down pumps of long life, relatively expensive, for the dry-weather flow, and pumps of low first cost and relatively short life for intermittent storm pumping.

The storage tank is supported by 761 whole timber piles about 25 ft. long, which are driven down into the boulder clay. The test adopted was a sinking of $\frac{7}{8}$ in. with a 24-cwt. monkey falling 7 ft. 6 in. The piles will have to bear from 18 to 25 tons each when the tank is full of sewage.

The existing southern outfall terminated in a length of 18-in. pipes. These have been removed, and 30-in. pipes are being substituted, and the outfall extended to low-water mark. The northern outfall will be retained as a storm relief. It can never come into operation unless the pumps at Poplar-road are overpowered or break down. Under such circumstances the liquid escaping can only be what overflows from the upper end of a main sewer more than a mile long. There are no other storm overflows, as it was desired to prevent the discharge of sewage at any time and under any circumstances on a foreshore which is used and will be increasingly used by the public as a playground.

The future resident population on which the works have been based has been taken at 76,275. The absence of roundness in this figure results from a division of the district into areas, and the allocation of a definite future population density to each. The estimated future population may seem large, but it should be remembered that there are no less than eighty towns in England which trebled their population in the thirty years between 1871 and 1901.

The maximum storm flow is estimated to be at the rate of 400 gallons per head per diem for each resident, and has been arrived at by assuming $\frac{1}{4}$ in. of rain reaching the sewers per hour from 1,200 sq. ft. per house, and by adding the sewage proper and the ascertained leakage into the old sewers. The sewers have been designed for this flow from the future population given, but the capacity of the pumping plant to be installed now is for a population of 38,000. It can be increased when required. The outfall discharge pipe will have to be supplemented by further discharging capacity before the ultimate population is reached, but it is more than sufficient for the population for which the present pumping plant is provided.

It has been possible to arrange the inclinations of the sewers (other than small pipe sewers) in such a way that the velocity attained by a flow 50 per cent in excess of the average dry-weather flow from the present population shall in no case be less than 120 ft.

* Paper read at the Meeting of the Institution of Municipal and County Engineers at Cleethorpes on Saturday last.

[illegible] for the supply of which an agreement has been en- [illegible] station, the price in both cases being for gas delivered at the stations. Other sources of power have been [illegible] steam from the destructor. In view of the complete [illegible] munity from flooding, none of them offers any advan- [illegible] present there will be no destructor steam at night.

[illegible] work was rather more than half finished the contractor abandoned his contract, and the remainder of the [illegible] the scheme are being carried out by direct labour.

The sewage will be discharged during the whole of the ebb tide with the usual reservation as to heavy rain or emergencies. This period has been fixed to comply with the requirements of the Humber Conservancy, although the float experiments show, and the author believes, that the proper period is one commencing at two hours before high water and ter- [illegible]

[illegible] summer months; as many as 50,000 people visit the town on the August Bank Holiday. The cleansing of [illegible] By these works Cleethorpes will have done all that is within her power. The Grimsby sewage outfall, which is near high-water mark, is a source of pollution to the shores of both Grimsby and Cleethorpes. This outfall is to be moved to allow of the construction of the new dock, which is to be placed on the [illegible] It is hoped that the new position will be free from objection.

[illegible] of the sewage tank was for a reinforced-concrete tank on reinforced-concrete piles. [illegible] was £10,000. The Local Government Board sanctioned the design, and gave ten years for the repayment of the loan. The author re-designed the tank, using mass concrete and timber piles. The estimated cost was £13,750, for which the board indicated their intention to give twenty-five years for repayment. The relative figures, [illegible] that

	Estimated cost.	Repayment period.	Annual charge.
[illegible] tank	£10,000	10	£1,235
[illegible]	13,750	25	880

The district council decided to adopt the mass concrete design.

The author considers this decision was sound, all things considered; he does not, however, wish to be understood as approving in all cases of methods of construction which justify a long repayment period. The establishment of a proper balance between the life of the works and the immediate requirements of the purchaser is probably the most difficult general, as apart from purely technical, problem with which the constructional engineer has to deal.

The overflow level of the storage is 21·25 ft. above ordnance datum, and the level of the lowest draw-off [illegible] ordnance datum. High water of ordinary Spring tides is +10·40. When the tank is used as a balancing tank—that is to say, with the outlet valve [illegible] and the pumps delivering storm sewage at their full present capacity—the discharge pipe will deliver the necessary quantity at high water of a Spring tide without the tank filling up.

The original scheme was prepared by the late Mr. Egbert Rushton, then surveyor to the council. The lines of outfall sewers laid down by him, as well as the approximate sites of the pumping stations, have not been materially departed from.

The works have, with the exception of a portion of the sewers executed by contract, been carried out under the supervision of Mr. James McKie, M.INST.C.E., first as resident engineer on the contract works, and later as officer in charge of the works done by direct labour. Mr. Guy and Mr. Hirst have acted as assistants to Mr. McKie in the construction.

Each pumping station will be provided with two stage air compressors, arranged to act as compressors for engine-starting purposes, and as vacuum pumps [illegible] the pumps when starting.

[illegible] tank has been constructed on a public recreation ground, provision has been made that all air exhausted from it shall pass through an air filter composed of a thickness of 12 ft. of clinker, in three successive layers of 4 ft. each, on which a stream of [illegible] of the air filter becoming frozen, a special water- [illegible] a small stream of warm water will run from the air filter delivery, which should prevent freezing. If, however, both the air filter and trap become frozen, the covers on the tank are of such a weight that they will blow off before any dangerous air pressure can [illegible] tank.

[illegible] with a gas jet.

The machinery is being supplied by the following firms: Gas engines, Crossley Brothers; reciprocating pumps, Tangyes, Limited; centrifugal pumps, Drys- [illegible]

The original estimate of the cost of the work was £58,000. The final cost will be greater, by reason of the rise in prices since the original estimate was made, and because the greater part of the works have been carried out by direct labour. There is also an increase due to the altered design of the storage tank.

The first of these was unavoidable, and the increase due to the second will be justified by the better result [illegible] will not be large, and, seeing that the scheme, with small additions, is designed to provide for 75,000 residents, the ratio of cost to population is a very moderate one.

The author desires to make two observations arising out of the consideration of the design and execution of works of this character, which, however, have no special application to Cleethorpes.

(1) There is need of co-ordination between the practice of the committees of Parliament and the Local Government Board in respect to long periods for constructional works. Parliamentary committees, in de- [illegible] on the term for repayment, do not always take detailed evidence of the durability of the works to be constructed. The board make a detailed investigation. The results are often widely different in the two cases. For instance, in a recent case, a local authority having obtained by an Act a very long repayment period, proceeded to construct a substantial portion of the works by methods which, if under the purview of the Local Government Board, would have resulted in a ten years' period being fixed.

(2) In carrying out works by direct labour, the unsatisfactory nature of the restriction contained in sec. 174 (4) of the Public Health Act, 1875, is brought forcibly into prominence. Every important unit of plant or machinery has to be publicly advertised for, with the result that the engineer generally has to explain why the lowest tender should not be accepted. This has not created any difficulty at Cleethorpes, but it is not so everywhere. Where an open advertisement for plant or machinery is concerned, the author ventures to assert that in nine cases out of ten the lowest tender should not be accepted. In contracts for general construction probably that holds in half the cases that arise. The system of limited tendering seems to be technically barred by the Public Health Act, although it is in frequent use by many of the larger municipal authorities. An authority, properly advised, ought to be able, on its full technical right and without fear of the auditor—who is, to some ex- [illegible] of a special appliance and make a contract for supply. Further, it is often forgotten that an engineer cannot in all cases apply a test on delivery, or during the necessarily short maintenance period, which will enable him to say whether an appliance is durable. The tests are often impossible or relatively too expensive. If the Local Government Board had statutory power to dispense with sec. 174 (4), they could so exercise their discretion as to prevent the abuses at which the sub-section is presumably aimed. Most public authorities include a proportion of members who, under all circumstances, want to accept the lowest tender, and who are apt to regard any advice given to them to the contrary as being in some way interested. No doubt the process of driving a coach and four through an Act of Parliament has points in its favour as a practical expedient; but engineers, trained to apply the laws of nature to everyday affairs, are predisposed to methods of law and order.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. PICKERING, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

HINCKLEY MEETING.

A East Midland Division meeting [illegible] the Council Offices, Hinckley, on Saturday, October 3rd.

PROGRAMME.

10 a.m.—[illegible] Hinckley, to [illegible]

11.15 a.m.—The members and visitors will be [illegible] by the chairman (Mr. G. [illegible]) and members of the Hinckley Urban District Council.

11.30 a.m.—Discussions on the following papers: "[illegible] Municipal Work at Hinckley," by Mr. E. H. Crump, A.M.I.C.E., [illegible] Hinckley Urban District Council; and "Bye-laws and the Housing Question," by Mr. W. H. [illegible] A.M.I.C.E., [illegible]

12.15 p.m.—[illegible] the council offices.

1 p.m.—Luncheon at the Town Hall, at the kind invitation of the chairman and members of the Hinckley Urban District Council.

2.15 p.m.—Proceed in motor conveyances (at a charge [illegible] per person) to inspect the workmen's dwellings erected and in course of erection [illegible], and thence to the Snarestone Waterworks, 14 miles distant, to inspect the pumping station, &c., where tea will be provided by Mr. E. H. Crump.

4.15 p.m.—Leave Snarestone and drive to Gopsall Park, where visitors will be given the opportunity of inspecting the gardens, by kind permission of Earl Howe.

6 p.m.—Arrive at Hinckley Railway Station.

E. H. CRUMP, A.M.I.C.E., *Hinckley District Secretary*, Hinckley.

E. G. MAWBEY, M.INST.C.E., *District Chairman*, Leicester.

J. W. DUDLEY ROBINSON, B.SC.(LOND.), *Secretary*.

92 Victoria-street, Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

B. WYANT, *Secretary*.

39 Victoria-street, S.W.

ROYAL SANITARY INSTITUTE.

YORK MEETING.

On Saturday, October 28th, at a meeting of the Royal Sanitary Institute at York, Mr. F. W. Spurr, the city engineer, will open a discussion on "The Biological Treatment of the York Sewage."

In the afternoon visits will be made to the pumping station at Fulford, the sewage works at Naburn, and the new Earswick model village.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ASSISTANT SURVEYOR.—September 26th.—Bridgwater Rural District Council. £85 per annum.—Mr. W. A. Collins, surveyor.

SURVEYOR AND INSPECTOR.—September 26th. Swaffham Rural District Council. £110 per annum. Mr. S. Matthews, clerk.

DIVISIONAL SURVEYOR. September 26th.—East Suffolk County Council. £135–£150 per annum.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

GENERAL ASSISTANT. September 26th. East Suffolk County Council. £90–£120 per annum.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

ASSISTANT ROAD SURVEYOR.—September 26th.—Cupar District Committee, County of Fife. £100 per annum.—Mr. W. D. Patrick, district clerk, Cupar, Fife.

JUNIOR INSPECTOR.—September 28th.—Cheltenham Town Council. £65 per annum.—Mr. R. O. Seacome, clerk.

DESTRUCTOR AND SEWAGE WORKS MANAGER.—September 29th.—Corporation of Ealing. 50s. per week, with house.—Mr. W. R. Hicks, borough engineer and surveyor.

TEMPORARY ASSISTANT (Borough and Water [illegible] Department). September 29th. Tunbridge Wells Corporation. £3 per week.—Mr. W. C. Cripps, [illegible].

CLERK OF WORKS.—September 29th.—Portsladeby-Sea Urban District Council. £2 10s. to £3 per week.—Mr. Ernest H. Kempe, Council Offices.

TEMPORARY ASSISTANT. September 29th.—Corporation of Tunbridge Wells. £3 per week.—Mr. W. H. Maxwell, borough and water engineer.

GENERAL DRAUGHTSMAN (TEMPORARY).—September 30th.—Hampstead Borough Council. £3 3s. per week. Mr. O. E. Winter, borough engineer.

JUNIOR DRAUGHTSMAN (TEMPORARY).—September 30th.—Hampstead Borough Council. £1 10s. per week.—Mr. O. E. Winter, borough engineer.

CLERK (TEMPORARY).—September 30th.—Hampstead Borough Council. £2 2s. per week.—Mr. O. E. Winter, borough engineer.

SURVEYOR.—September 30th.—Blaenavon Urban District Council. £130 per annum.—Mr. I. G. Gwyn-Thomas, clerk.

CHIEF DRAUGHTSMAN.—September 30th.—City of Westminster. £200–£250 per annum.—Mr. John Hunt, town clerk, City Hall, Charing Cross-road, W.C.

CLERK OF WORKS.—September 30th.—Axminster Rural District Council. £3 3s. per week.—Mr. C. Forward, clerk.

BOROUGH SURVEYOR'S ASSISTANT.—September 30th.—Smethwick Town Council. £120 per annum.—Mr. A. Hosken, borough surveyor.

ROAD FOREMAN AND BUILDING INSPECTOR.—October 1st.—Buxton Urban District Council. 37s. 6d.–£2 5s. per week.—Mr. F. Langley, engineer and surveyor.

TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.—October 1st.—Corporation of South Shields. 35s. per week.—Mr. Leslie Roseveare, borough engineer.

—ROAD FOREMAN.—October 1st.—Hampton Urban District Council. £2 5s. per week.—Mr. Sidney H. Chambers, surveyor.

DISTRICT SURVEYOR.—October 2nd.—Monmouthshire County Council. £190–£230.—Mr. H. Stafford Gustard, clerk, Newport, Mon.

INSPECTOR OF NUISANCES.—October 3rd.—Corporation of Bolton. £85—£120.—Dr. John E. Gould, medical officer of health.

ARCHITECT.—October 5th.—Aberdare Education Committee.—Mr. T. Botting, director of education, Education Offices.

RESIDENT ENGINEER.—October 8th.—Fareham Rural District Council. 3½ guineas per week.—Mr. Alfred Laker, clerk, 97 West-street, Fareham, Hants.

ASSISTANT SURVEYOR (Temporary).—October 10th.—Harrow-on-the-Hill Urban District Council. £2 per week.—Mr. John Strachan, clerk.

TOWN FOREMAN.—October 10th.—Willenhall Urban District Council. 35s. per week.—Mr. T. Edgar Fellows, engineer and surveyor, Town Hall.

ASSISTANT ENGINEERS. East Ham. Public Works Department. [illegible] for the Colonies. Whitehall [illegible] London, S.W.

ASSISTANT ENGINEERS. [illegible] the Gold Coast. Public Works Department. [illegible] 400. Crown Agents for the Colonies. Westminster [illegible] London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but the responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1048) subject to later confirmation by letter.*

ST. HELENS. October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25. Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but these responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1048) subject to later confirmation by letter.*

Buildings.

BEACHBRIDGE. September 25th. October 25th.—For the enlargement of the asylum, for the County Asylum.—Mr. H. Parker, architect, The Square, Bootle, Liverpool.

STROUD. September 26th. October 5th.—For the erection of a tuberculosis block, for the Joint Hospital Board.—Mr. G. P. Milburn, architect, 7 Rowcroft, Stroud.

DYSART. September 26th.—For the erection of a school, for the School Board.—Mr. W. Williamson, architect, Royal Bank Buildings.

KIRKCALDY. September 26th.—For the erection of [illegible], for the Kirkcaldy and District School Board.—Mr. W. Williamson, Royal Bank Buildings, Kirkcaldy.

WORCESTER.—September 28th.—For the erection of a bridge over Langhern Brook, for the corporation.—Mr. Thomas Caink, city engineer.

LINCOLN.—September 28th.—For the erection of a depot, for the urban district council.—Mr. J. Wilding, surveyor.

WHITEFIELD.—September 28th.—For alterations to public offices and the erection of fifty-eight houses, for the urban district council.—Mr. G. M. Denton, engineer and surveyor.

FAVERSHAM.—September 28th, 29th, 30th—October 14th.—For laying cast-iron pumping main, supply mains, with all necessary fittings, and the construction of a service reservoir, for the rural district council.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster.

NOTTINGHAM.—September 29th.—For the erection of four verandahs at isolation hospital, for the corporation.—Mr. A. Dale, city architect.

SOMERSET.—September 29th.—For rebuilding High Bridge, on the Taunton and Ilminster road, for the county council.—Mr. E. Stead, county surveyor, Wells.

CARDIFF.—September 29th.—For the erection of 144 workmen's dwellings, for the corporation.—Mr. W. Harpur, city engineer.

SOUTH MIMMS.—September 29th.—For the erection of twelve cottages, for the rural district council.—Mr. G. Simcox, surveyor, Bearwood, Potters Bar.

GLASGOW.—September 29th.—For the reinforced-concrete floor work at municipal buildings, for the corporation.—Messrs. Watson & Salmond, 242 West George-street, Glasgow.

MOLD.—September 30th.—For the erection of fire station and caretaker's house, for the urban district council.—Mr. R. S. Kelly, clerk.

STAFFS.—September 30th.—For the erection of a school, for the Education Committee.—Mr. G. Balfour, County Education Offices, Stafford.

ST. AUSTELL.—September 30th.—For the construction of a tunnel 500 yds. in length, with airshafts, and laying stoneware pipe sewer with manholes, for the rural district council. Mr. W. H. Moffat, surveyor.

CHISWICK.—September 30th.—For the construction of a brick and concrete culvert, for the urban district council.—Mr. E. Willis, surveyor, Town Hall.

HEDON.—October 1st.—For laying water service piping, for the corporation. Mr. H. Percival Binks, borough surveyor.

LONDON.—October 2nd.—For the construction of a service reservoir, for the Metropolitan Water Board. Chief Engineer, Savoy-street, Strand, W.C.

STAFFORD.—October 3rd.—For the erection of an engineering school, for the Education Committee.—Mr. George Balfour, director of education, County Education Office, Stafford.

WEST RIDING.—October 3rd.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

ST. ANNES-ON-SEA.—October 3rd.—For extending [illegible] and [illegible] for the urban district council.—Mr. T. Bradley, clerk.

SHEFFIELD.—October 3rd.—For the execution of works in connection with the covering of the river Sheaf, consisting of bridge widening, new weir, new bridge, retaining wall, and new street, for the corporation.—City Engineer.

DARTFORD.—October 3rd.—For the extension of the electricity works, for the urban district council.—The Surveyor.

BLACKBURN.—October 5th.—For the erection of a dispensary, for the corporation.—Mr. W. Stubbs, borough and water engineer.

EXETER.—October 5th.—For the erection of fourteen blocks of houses and flats, for the corporation.—City Surveyor.

HEYWOOD.—October 5th.—For extensions to electricity works, for the corporation. Mr. J. B. Nuttall, borough surveyor.

DEVIZES.—October 5th.—For the erection of six workmen's dwellings, for the rural district council.—Mr. T. V. Trumper, Ivy House, Devizes.

SEVENOAKS.—October 6th.—For the erection of sixteen cottages, for the urban district council.—Mr. S. Towlson, surveyor.

STRATFORD-UPON-AVON.—October 7th.—For the erection of thirty-six workmen's cottages, for the corporation.—Mr. R. Dixon, borough surveyor.

SHEFFIELD.—October 7th.—For hospital extension, for the corporation.—City Architect, Town Hall.

COLWYN BAY.—October 8th.—For the erection of a refuse destructor, with steam boiler and auxiliary machinery complete, for the urban district council.—Mr. E. M. Lacey, consulting engineer, 12 Victoria-street, Westminster, S.W.

WARRINGTON.—October 9th.—For the erection of a school, for the Education Committee. Mr. J. M. Murray, secretary, Education Office.

LANCASHIRE.—October 10th.—For the erection of a police station, for the Standing Joint Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

WEST SUSSEX.—October 13th.—For the erection of new schools and alterations to existing schools, for the Education Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

LONDON.—October 20th.—For the extension of engine-house, boiler-house, coal store, and other works, for the county council.—Chief Engineer.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

WALLASEY.—(No date).—For electricity works extension, for the corporation.—Electrical Engineer, Sea View-road.

Iron and Steel.

BRADFORD.—October 7th.—For the duplication of seven pipe syphons, the supply of 7,500 tons of cast-iron pipes, and the supply of 900 tons of mild-steel pipes, for the corporation.—Mr. J. Watson, waterworks engineer, Town Hall.

GRAYS THURROCK.—October 5th.—For the supply of 680 sq. yds. of wire fencing, with wrought-iron standards, and four wrought-iron field gates, for the urban district council.—Mr. A. C. Lanes, surveyor.

Roads.

LEATHERHEAD.—September 27th.—For a supply of broken granite and steam rolling, for the urban district council.

HANWELL.—September 28th.—For the supply of broken Guernsey granite and distilled tar, for the urban district council.—Mr. Percy Scott, clerk.

RUNCORN.—September 28th.—For making up with tarred macadam certain streets and passages, for the rural district council.—Mr. R. Garnett, surveyor, Bold-street Chambers, Warrington.

WIGAN.—September 28th.—For paving work with granite setts, for the corporation.—Mr. A. T. Gooseman, borough engineer.

UXBRIDGE.—September 28th.—For steam rolling and scarifying, for the urban district council.—Mr. W. T. Harvey, clerk.

LLANDAFF.—September 29th.—For street improvement works, for the rural district council.—Mr. James Holden, surveyor, 20 Park-place, Cardiff.

COWES.—September 29th.—For the supply of broken granite and other road material, for the urban district council.—Mr. J. W. Webster, engineer and surveyor.

BARNET.—September 29th.—For the construction of new roads on the housing estate, approximately 1,800 sq. yds., together with about 1,000 ft. run of sewers, for the urban district council.—The Surveyor.

GATESHEAD.—September 29th.—For paving work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

LITTLEHAMPTON.—September 30th.—For the supply of granite chips, pit gravel, and hoggin; also steam rolling, for the urban district council.—Mr. H. Howard, surveyor.

WOOD GREEN.—September 30th.—For the execution of private street works, for the urban district council.—The Surveyor.

CHISWICK.—September 30th.—For making up a street, for the urban district council.—Mr. E. Willis, surveyor.

KIRKCALDY.—October 3rd.—For laying a road with granite setts, for the corporation.—Burgh Surveyor.

TANGIER.—October 3rd.—For road construction, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

PRESTWICH.—October 4th.—For work of road improvement, for the urban district council.

SALFORD.—October 6th.—For paving, flagging and sewering works, for the corporation.—Borough Engineer.

BARCELONA.—October 9th.—For street paving works, for the municipality.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

Sanitary.

GRANGE-OVER-SANDS.—September 28th.—For the construction of 800 lin. yds. of sewers, for the urban district council.—Mr. T. Huddleston, surveyor.

UCKFIELD.—September 28th.—For the construction of sewers, for the urban district council.—Mr. W. H. Overton, 22 Ship-street, Brighton.

STRATFORD-UPON-AVON.—September 28th.—For the construction of drainage, manholes and flushing works, for the corporation.—Mr. R. Dixon, borough surveyor.

HAVANT.—September 28th.—For removing, washing, and replacing 2,000 cub. yds. of filtering material in the filter-beds, for the urban district council.—Mr. A. E. Stallard, surveyor.

DURHAM.—September 29th.—For the removal of refuse, [illegible] Mr. J. Mo[illegible], inspector, Avenue House, Shincliffe, Durham.

WESTHOUGHTON.—September 30th.—For drainage works extension, for the rural district council.—Mr. G. Hayes, engineer and surveyor.

SALTASH.—October 1st.—For the removal of house refuse and road sweepings, for the corporation.—Borough Surveyor.

QUEENSTOWN.—October 2nd.—For the construction of an outfall sewer, for the urban district council.—The Clerk.

BANBURY.—October 3rd.—For the construction of about 1 mile of 18-in., 15-in., and 9-in. cast-iron and stoneware pipe sewers, with manholes, storm overflow chamber, erection of engine-house, refuse destructor-house, and other works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

WATH-UPON-DEARNE.—October 3rd.—For the alteration and reconstruction of the sewage disposal works, for the urban district council.—Mr. J. H. Drew, engineer.

MANCHESTER.—October 3rd.—For the supply of graded slag, stoneware pipes, best bends, stoneware covers, and stoneware underdrainage tiles, for the Rivers Committee.—Secretary, Town Hall.

BISHOP AUCKLAND.—October 5th.—For the supply of disinfectants, for the rural district council.—Dr. Penfold, medical officer of health, 9 Craddock-street, Bishop Auckland.

PRESTON (Lancs).—October 9th.—For taking up earthenware pipes and relaying in cast-iron and earthenware socket pipes, for the rural district council.—Messrs. Myres, Veevers & Myres, 15 Chapel-street, Preston.

ROMFORD.—October 17th.—For the construction of surface-water sewer and street works, for the rural district council.—Mr. W. J. Grant, surveyor.

LEEDS.—October 21st.—For the construction of three screening chambers, screening-house, three detritus pits, two mixing chambers, distribution chamber, [illegible] chamber, storm overflow culvert and outlet, 18 acres of bacteria beds, effluent channel and culverts and gauging chambers, and laying cast-iron feed mains, for the corporation.—Mr. Geo. A. Hart, sewerage engineer.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Miscellaneous.

ASHTON-UNDER-LYNE.—September 28th.—For the supply of 9,200 yds. of artificially prepared blast-furnace slag, for the corporation.—Mr. J. Rowbottom, engineer, Town Hall.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BENTLEY.—For the erection of 100 houses, for the urban district council.—Mr. E. G. Whatley, surveyor.

A. Storey, Hethorpe, Doncaster (2 houses)	£14,344
E. G. Stubbs, Bentley, Doncaster (8 houses)	6,699
E. G. Stubbs, Bentley, Doncaster (extra fencing)	[illegible]

CHISWICK.—For a temporary office range at the Chiswick Urban District Council's river depot, for the Chiswick Chamber of Commerce.—Mr. Edward Willis, borough surveyor:

J. & J. F. Pallant	£164
L. L. Leeder & Co.	157
Nichols Brothers	141
H. Fowler	133
E. Blackburn	132

EVESHAM.—For the erection of workmen's houses, for the rural district councils of Evesham and Pebworth.—Mr. E. Holloway, surveyor.

	H[illegible]	[illegible]	[illegible]
	£	£	£
Lepley & Co., Evesham	3,[illegible]	3,[illegible]	£1,990
Cliff & Co., Evesham	3,350	4,018	1,950
J. Knox, Evesham	3,150	3,849	1,980
W. White, Evesham	3,335	4,020	—
Stewart & Co., Broadway ..	3,440	4,010	2,050
W. Cooper, Blackheath, Staffs	3,125	3,950	1,885
Matthews & Mullis, Stratford-on-Avon			1,736
W. Drew, Cheltenham	3,300	—	1,799
G. Sorrell, West Bromwich	[illegible]	4,0[illegible]	2,010
H. W. Crisp, Evesham	[illegible]	4,0[illegible]	1,990

HIGH WYCOMBE.—For refuse destructor and water-tube boiler, for the corporation.—Mr. F. J. Rushbrooke, borough engineer and surveyor:—

Maudslay, Allott & Co. (back feed)	£[illegible]
Hughes & Stanton (front feed)	3,166
Heenan & Froude (back feed)	3,340
New Destructor Company (back feed)	2,6[illegible]
Meldrums, Limited (back feed)	2,136
Meldrums, Limited (front feed)	2,361

[illegible] WYCOMBE. For [illegible] pipe and water-tube [illegible] the [illegible] Mr. [illegible] the above reported [illegible] and [illegible]

[illegible] & Hamblyn £1,987
Mannesmann Limited [illegible]

[illegible]. For [illegible] in certain [illegible] for the [illegible] Authority [illegible]

Petter Steel Works

[illegible] Southampton [illegible]
[illegible] Manchester [illegible] Company [illegible]
[illegible] [illegible]
[illegible] & Co. Southampton [illegible]

Stoke-on-Trent Branch

[illegible] Manchester [illegible] Company [illegible]
London [illegible]
[illegible] Southampton [illegible]
[illegible] & Co. [illegible]

[illegible] ASHFIELD. For work of [illegible] for the [illegible] council. Mr. W. [illegible] surveyor.

J. W. [illegible] Accrington [illegible]

[illegible]. For the [illegible] the [illegible] council. Mr. [illegible] surveyor.

[illegible] & Co., London [illegible]
[illegible] & Co., London [illegible]
[illegible] Middlesbrough [illegible]

Surveyor's estimate [illegible]

SEVENOAKS. For the [illegible] at [illegible] and Sevenoaks Granite Chippings, for the rural district [illegible] Mr. [illegible] surveyor.

[illegible] Limited, Rochester [illegible] per ton.
[illegible] and Stone Stanton Granite Company, Limited, Leicester [illegible] per ton.
[illegible] Granite Block and [illegible] Company, Limited, Leicester [illegible] per ton.
Penlee and St. Ives Stone Quarries, Limited, Bristol.—2 in., 13s.; ¾ in., 11s. per ton.
Rowe & Mitchell, London.—2 in., 15s. 3d.; ¾ in., 14s. 11d. per ton.
[illegible] Brothers, Limited, Greenock [illegible] per ton.
[illegible], Limited, London [illegible] per ton.
J. Mowlem & Co., London.—2 in., 15s. 11d.; ¾ in., 13s. 9d. per ton.
[illegible] Granite Company, Limited, London [illegible] ¾ in., 15s. 7d. per ton.

WELLINGBOROUGH. For the erection of a public convenience, for the urban district council. Mr. E. Y. Harrison, surveyor.

Hooker Brothers, Wellingborough £[illegible]
W. Stevens, Wellingborough 365
E. Brown & Son, Limited, Wellingborough [illegible]
Surveyor's estimate, £379.

WELLINGTON. For the construction of stoneware pipe sewer, for the urban district council. Mr. Geo. Ridley, engineer and surveyor:—

G. P. Trentham, Birmingham 1625
G. H. Ford & Co., Wellington [illegible]
A. Pearce, Wellington [illegible]
Engineer's estimate, £550

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

1. Institution of Municipal and County Engineers. East Midland District Meeting at Hinckley.
24.—Royal Sanitary Institute: Meeting at York. Discussion on "Biological Treatment of the York Sewage."

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency, only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH OF ROYAL TUNBRIDGE WELLS.

BOROUGH AND WATER ENGINEER'S DEPARTMENT.

TEMPORARY ASSISTANT.

The Council are prepared to consider applications for the post of Temporary Assistant in the Borough and Water Engineer's Department. The person appointed must be a good draughtsman, and be thoroughly experienced in the use of the Dumpy Level, Theodolite, and other usual surveying instruments, in the setting out of Sight Rails for sewerage works, taking of Levels, and Setting Out of Works; also the preparation of Estimates, and other work of a Borough Engineer's Office, and must have had good experience in a similar capacity under a public authority.

The appointment is rendered necessary by the enlistment of members of the Staff in His Majesty's Army as a consequence of the present European War, and, subject to the services of the person appointed proving entirely satisfactory, will be for a period of not less than six months, with a possibility of extension should the permanent staff not have returned within twelve months at the end of that period.

Any further information, if desired, may be obtained on application to Mr. W. H. Maxwell, A.M.I.C.E., Borough and Water Engineer.

Salary will be at the rate of £3 (three pounds) per week, paid monthly.

Applications to be in candidate's own handwriting, and to state age and experience, and earliest date at which duties can be commenced, to be accompanied by copies (not more than three) of testimonials, to be sent to the undersigned not later than 10 a.m. Tuesday, 29th September, 1914.

W. C. CRIPPS,
Town Clerk.

Town Hall,
Tunbridge Wells.
September 14, 1914. (1,954)

TENDERS WANTED.

CITY OF LEEDS.

LEEDS CORPORATION ACT, 1905 (SEWERAGE).

SEWAGE DISPOSAL SCHEME AT THORPE STAPLETON.

CONTRACT No. 50.

Consisting of the execution of the following sections of the work on the Sewage Works Lands at Thorpe Stapleton:—

Part No. 1.—Three Screening Chambers, Screenhouse, three Detritus Pits, two Mixing Chambers, Distributing Chamber and all accessories.

Part No. 2.—Four Precipitation Tanks, Main Gauging Chamber, Storm Overflow, Storm Overflow Culvert and Outlet, &c.

Part No. 3.—Eighteen acres of Bacteria Beds, complete with Silt Mains, Effluent Channels and Culverts and Gauging Chambers, &c., including the laying of Cast-iron Feed Mains.

TO PUBLIC WORKS CONTRACTORS.

The Sewerage Committee of the Leeds Corporation are prepared to receive Tenders for the above work.

The Contract Drawings may be inspected, and copies of the Specification, Bills of Quantities, Form of Tender, &c., can be obtained at the office of the Sewerage Engineer (Mr. Geo. A. Hart, M.INST.C.E.), 26 Great George-street, Leeds, on and after Monday, the 5th October, 1914, upon payment of a deposit of £10, which will be returned on receipt of a *bonâ-fide* Tender. Cheques must be crossed, and made payable to the City Treasurer, Leeds.

Tenders must be on the official forms supplied, enclosed and sealed in the endorsed envelope provided, and delivered at the Town Clerk's Office, Pearl Chambers, East-parade, Leeds, not later than 10 a.m. on Wednesday, the 21st October, 1914.

The Corporation shall not be bound to accept the lowest or any Tender.

(By order)
ROBERT E. FOX,
Town Clerk.

Town Clerk's Office,
Pearl Chambers,
East-parade, Leeds.
September 30, 1914. (1,935)

EX-PUPILS AND JUNIOR ASSISTANTS.

WANTED. Appointment as Junior Assistant (22); articles recently expired (Municipal Engineer). Practical experience in surveying, levelling, waterworks, sewerage, sewage disposal and town planning. Passed Preliminary and Intermediate (Quantities) Examinations, Surveyors' Institution.—Box 1,470, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,952)

(*Continued on p.* XXVI.)

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

London Water Supply.

The research work which is being carried out under the supervision of Dr. Houston is a continuation of that dealt with in preceding reports which have described the search for pathogenic microbes in river water and in crude sewage. In the tenth report the earlier results are summarised, and in addition an account is given of a further and more prolonged research for the typhoid bacillus in crude sewage. Dr. Houston states that "it is perfectly useless in work of this kind merely to register negative results," and shows how it can be proved that when a known number of pathogenic microbes are present, some, at least, can be isolated. His practice, therefore, is to divide each sample of water or sewage into two parts, and to inoculate one of them with a known number of pathogenic microbes. He then examines both under the same conditions. He finds that it is possible under these conditions to isolate the pathogenic germs, when present, in the proportion of one per 9 c.c. in the case of the typhoid bacillus, and of one per 19 c.c. in the case of Gärtner's bacillus. Thus it is argued, apparently, that if it is possible to find the germs that have been added to a sample of sewage or water, the failure to find germs in a similar sample to which they have not been added proves their absence. The argument is, however, not quite convincing, for it is clear that if any pathogenic germs were present in the water, the chances of finding some would be increased if more were added. If the germs were added to sterile water, and were then isolated, it would be a clearer proof that it is possible to find pathogenic germs where present in a certain proportion; if, however, they could not be isolated, there would be no proof that the sample of sewage or water did not contain the same number. The results of the examination of 101 samples of river water showed the absence of typhoid germs with the exception of one doubtful typhoid microbe and one doubtful Gärtner's bacillus. From this Dr. Houston concludes that the typhoid bacillus is not uniformly present in 9 c.c. of water, and that the Gärtner's bacillus is not uniformly present in 19 c.c. of water. It should be noted that this is a very cautious statement; taken by itself it means very little. Dr. Houston does not say that they are uniformly absent, which would be a very different thing. The report, unless it is very carefully read, is apt to convey such an impression, however, to the layman. With regard to crude sewage, we are told that 100 samples were examined, and that it was found that the typhoid bacillus could be isolated from an inoculated sample when present in the proportion of 1 per ·00066 c.c. of sewage.

It appears from the report that 1·17207 bacilli per cubic centimetre were added to the water samples, and that 10·6036 microbes were isolated from 500 c.c., which equals ·021207 microbes per cubic centimetre. Thus it appears that it is only possible to isolate a very small proportion of the germs which are known to be present. If, for instance, one typhoid bacillus per cubic centimetre had existed in the river water, apparently it could not have been detected. It seems that, as far as tests go, a certain number of germs may exist—too few for isolation—in the raw water, and that after adding others, the task of isolation being easier, a very small proportion can be isolated. With regard to sewage, it appears that 268 typhoid germs were added to ·01 c.c. of sewage, and that the number of typhoid bacilli actually isolated from ·01 c.c. was, on the average, seventeen. Can the method which will only isolate so small a proportion of the microbes known to exist in a given sample prove that typhoid germs are non-existent in a similar sample of the same sewage? We are, apparently, asked to believe that typhoid germs are absent from a sample of water because a method which can only detect two where 117 are known to exist has failed to find any, and also that typhoid germs are absent from a sample of sewage because a method which can only detect 17 where 268 are known to be present gives a negative result. Why, then, should it be assumed that the samples examined were quite free from typhoid germs before inoculation? Unless this assumption is justified, there appears to be no proof that germs can be isolated in the proportion of one per 9 c.c., or of one per 19 c.c., as stated in the report. Failing to follow the proof to this point, it is surprising to read that the results obtained become more reassuring "if it is permissible to hope" certain things which are set forth in order. Among these are such statements as "that it requires more than one typhoid bacillus to infect a susceptible individual with typhoid fever," or of "each draught of water being, so to speak, either a 'hit or miss' (an infection or a non-infection) unassisted by succeeding draughts of water." If these things have been proved it is unnecessary to hope that they are true, and their truth should be definitely stated; but unless they have been proved they are useless as argument, and it is therefore surprising to find them in a published scientific report, where they must at any rate create an impression and a belief in the mind of the public, concerning which the author is extremely careful to make no definite assertion.

Hydraulic Mains in Streets.

The decision of the Court of Appeal in *Charing Cross, West End and City Electricity Supply Company v. London Hydraulic Power Company* noted at page 56 *ante* is of considerable importance to companies and public bodies empowered to lay wires and pipes in streets, as well as to highway authorities. Put briefly, it amounts to this, that those who under statutory powers bring into a street for their own profit a dangerous

thing an honest, at their peril, spot altogether from any suspicion of negligence, to prevent it from escaping, and if it does escape they are responsible for the consequences." The dangerous thing in the present instance was water at high pressure, contained in four hydraulic mains belonging to the defendant company. Owing to subsidence of the soil of the road the mains were fractured, and the escaping water damaged the plaintiff company's electric cables. There was some attempt on the part of the defendant company to contend that the Act of Parliament under which two of the mains were constructed exempted them from liability. This argument was based on the fact that a subsequent Act (under which the other two mains were laid) expressly stated that nothing therein contained should exempt the company from liability for nuisance, whereas the earlier Act contained no such provision. The Court was invited to infer that this omission was intentional, and that its effect was to protect the company from responsibility. But inasmuch as the latter Act provided that the two Acts should be "read and construed together as one Act" it is not surprising that this contention did not prevail.

The case is interesting as an illustration of the application, and perhaps as an extension, of the doctrine laid down in the leading case of *Fletcher v. Rylands* (L.R., 3 H.L.C., 330). In that case there were underneath the defendant's land a number of disused mining shafts communicating with mines under adjoining land leased to the plaintiff. The defendant constructed a reservoir above these shafts. He was not personally guilty of any negligence, and employed competent persons to construct the reservoir, but it was not strong enough to bear the pressure of the water, which burst through the shafts and flooded the plaintiff's mine. It was held that the defendant was liable. Mr. Justice Blackburn, in his judgment, thus laid down the rule of law applicable in such cases: "The person who for his own purposes brings on his land and collects and keeps there anything likely to do mischief if it escapes, must keep it at his peril, and if he does not do so is, *primâ facie*, answerable for all the damage which is the natural consequence of its escape." It will be noted that in that case the dangerous thing was on the defendant's own land, and escaped on to the plaintiff's land, whereas in the hydraulic main case neither party had any right of property in the soil of the road. But the Court of Appeal (affirming Mr. Justice Scrutton) held that the doctrine applied nevertheless, and that the fact that the plaintiff company were not the owners of the soil, but merely had statutory powers to lay their cables in the road, was not material to the application of the rule.

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Traffic Statistics and Severity Factors.

The subject of severity factors for traffic on roads was one to which special attention was given in our last Special Annual Issue under the heading "Traffic Generally." In our issue of February 28th we published a letter in which Major W. W. Crosby made important practical suggestions with respect to the collection of information on this subject, and in the following issue—March 6th—we commented on the letter, and laid special stress on what seem to be certain essential elements of all comparisons of traffic effects. We pointed out in this article that there are two ways in which the problem may be attacked—we may compare tonnages modified by importance factors and related to costs, as measures, in different areas, of the combined efficiency of the roads and the vehicles, or we may assign severity factors to the vehicles and endurance factors to the different kinds of roads and compare efficiencies, measured in importance-tonnage in relation to the average severity-endurance factor, per mile.

In a useful paper, which will be found in another part of the present issue, Mr. J. Eastwood, Assoc.M.Inst.C.E., discusses the subject of traffic factors, with special reference to the writings of Mr. J. Walker Smith and Major W. W. Crosby, and to the researches of the Massachusetts Highway Commission. Mr. Eastwood fully bears out our contention that the tonnage factor is quite inadequate as a measure of traffic severity—a point on which Mr. Walker Smith lays great stress—and his study of the subject is well worth the attention of road engineers. There is, however, one element of prime importance the significance of which he does not seem to have fully grasped—this is, that we cannot assign a single severity factor to a particular kind of vehicle and a single endurance factor to a particular kind of crust, the reason being that these factors vary with the different vehicle-crust combinations. The average severity factor of a rubber-tyred delivery van, and the average endurance factors of granite setts and water-bound macadam, furnish us with no just estimate of the relative effects of the delivery van on granite setts and water-bound macadam respectively. Again, the rates of wear of a particular kind of crust will vary very much indeed according to whether the road is a dead flat, a gentle gradient, or a steep hill. Mr. Eastwood recognises the fact that the gradient has to be considered, but the effect of steepness is entirely different with different kinds of road stone, a gradient of 1 in 15 being no worse with some than 1 in 40 is with others, and so on. Mr. Eastwood's Table VI. gives a factor of 8 for motor cars, whether on a steep hill or on the level. This would hold good if the "level" stretches of road had really a small gradient, but not for dead flats. As regards iron-tyred motor vehicles, the element of road crust temperature is far more important than gradient for tarred roads. Similarly, one may find many other factors greatly affecting the results—gradient is only one and not the most important. Mr. Eastwood has, however, presented his view of the subject in a forceful and very practical manner, and his article is an important contribution to the study of traffic factors.

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Municipal Engineers and the War.

The "roll of honour" which we have published for the past few weeks shows that municipal engineers of suitable age have not been slow in coming to the assistance of their country in the present crisis. There must be many, however, who, although precluded for one reason or another from answering the call for active service, are anxious to do what they can to help in the great business in hand. In this respect municipal engineers are more fortunately situated than those following almost any other profession, for the technical knowledge which they possess is of a kind which may easily be turned to good account by the military authorities. We are fully confident that there is in no quarter any lack of inclination to serve, but many engineers may be in some difficulty as to the particular channel into which their energies may be most usefully directed. Herein lies the value of an excellent article on "The Municipal Engineer and the King's Forces," from the pen of Mr. G. Bertram Hartfree, the surveyor to the Alton Urban District Council, which appeared in the last issue of the *Journal* of the Institution of Municipal and County Engineers. Mr. Hartfree's theme is that to be of use in a civil capacity to His Majesty's Forces at the present time the municipal engineer must be prepared to anticipate the requirements of troops, to co-operate with responsible Army officers, and to be ready with practical suggestions on relevant local engineering matters. The article to which we refer shows how these principles may be applied to the important matters of water supply, sanitation, camp cookery,

Red Cross hospitals, and bridges, and a careful perusal of it will go far to enable the municipal engineer to earn the gratitude of those whom he may be called upon to assist by thoughtfully anticipating their wishes.

It may be within the recollection of some of our readers that a movement was started a few years ago with the object of encouraging municipal engineers to acquire such knowledge as would fit them to render useful assistance to the military authorities in case of need. For reasons into which it is not now necessary to enter, however, no great success attended the efforts of the promoters, and the matter was ultimately allowed to lapse. The object of the movement having become so much more urgent with the outbreak of war, it is proposed to revive the idea, and to form a Municipal Engineers' Technical Reserve, using the remnant of the old body as a nucleus. The immediate object is the compilation of a list of persons willing to act as engineering officers in the Territorial Forces, to assist the Royal Engineers in civilian capacities, or to give their services in any way that would be of assistance to the military or naval authorities. Opportunities would also be afforded for the exchange of views on military matters, and for the instruction of junior members. Mr. Hartfree is acting as hon. secretary, and will be pleased to hear from those who may be willing to join. In the event of a sufficient number coming forward, an opportunity will be given of electing a new committee and executive officers.

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Sanitary Services and the War.

It is more essential than ever, now that there are considerable concentrations of troops in various parts of the country, that the closest attention should be given to the details of sanitation, and it is therefore satisfactory to find that the Local Government Board has placed itself in communication with medical officers of health with a view to the adoption of precautionary measures for the protection of health and the prevention of disease. The circular which the Whitehall authorities have caused to be sent to the medical officers of health for Scotland lies before us, and as this is doubtless textually identical with that forwarded to such officers in every part of this country and Ireland, there need be no hesitation in stating that if the advice which it gives is strictly observed by those to whom it is addressed, not a little will have been accomplished in the maintenance of the sanitary services and the effective defence of public hygiene. Medical officers of health are invited to place themselves promptly in communication with the local military medical authorities, offering any services that may be useful, and this will readily suggest itself as a necessary and desirable step alike for the safeguarding of the local population as well as the men who are newly arrived upon the scene. The medical officer will, it is almost unnecessary to point out, have special facilities for giving valuable information and assistance to military sanitary officers on the following points: (1) In advising as to all local water supplies, and as to their protection from contamination; (2) in helping to secure satisfactory disposal of garbage and other refuse; (3) in securing satisfactory drainage or conservancy arrangements; (4) in the control of infectious disease, and in arranging for hospital provision for the ordinary infectious diseases, and for convalescent cases of enteric fever, and for the carrying out of disinfection. The sanitary and cleansing staffs will be able to supplement the efforts of the medical officers for the common good, and by this means we shall leave nothing to chance, either as regards preventive or protective measures rendered necessary to meet the present national crisis. It will be essential, of course, to give particular attention to the three outstanding diseases from which danger is most to be feared, viz., typhus fever, enteric fever, and smallpox—and with this end in view medical officers of health are advised to keep the medical officer in charge of local troops informed of any cases of infectious disease within the area, while, on the other hand, the military officer must also charge himself with the duty of notifying at the earliest moment cases for removal and isolation. A great deal of valuable work has already been done, so far with gratifying success, in meeting the none too stringent requirements of the Local Government Board—none too stringent considering what we have at stake—and we shall all hope that the sanitary organisations of the municipal and county authorities will be well able to meet the extraordinary call now made upon them in circumstances of national urgency and danger.

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Loan Periods.

The obligation which is cast upon local authorities by the Public Health Acts and other statutes of obtaining the sanction of the Local Government Board before borrowing money for public purposes on the security of the rates implies that the central authority has some duty of a supervisory character to discharge in regard to local finance. We do not presume to suggest exactly how far that supervision should go, but we are at a loss to understand the meaning of the protest which was recently made by one of the board's inspectors at York, and reported in our issue of last week. The inquiry related to the purchase of some land for a depôt extension, and the inspector appears to have taken exception to an observation made by the town clerk to the effect that the loan was required for as long a period as the Local Government Board would allow. The fact that no specific period was asked for does not appear to us to contravene any important principle, for if any definite time had been mentioned, it would have been subject to the board's approval, which could neither have been given nor withheld unless the board were in a position to say what the proper term should be. The inspector made the further point that, as a general rule, small loans should be paid off within a comparatively short time—a principle that will be generally accepted. Ultimately it was agreed to ask for a period of twenty years.

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Authority and Discipline.

The lot of the surveyor to the Cardigan Rural District Council does not seem to be an enviable one, judging from a report of the proceedings at the last meeting of that authority, which is before us as we write. It appears that the council had on a former occasion passed a resolution the effect of which was to withdraw the authority of the surveyor over the roadmen, a decision which it was now proposed to rescind. An amendment was moved, however, that the council retain authority over the roadmen, the reasons advanced being that it would not be to the advantage of the council as representatives of the ratepayers to give the surveyor full control, nor would it be advantageous to the roadmen to be in the hands of one man! This amendment was duly seconded and carried. It is hardly necessary for us to express our views on such a proceeding, or to comment upon its effect upon the discipline of the men, and its unfairness to the surveyor who has, presumably, to supervise without exercising authority or control. At the same meeting it was reported that the application of the surveyor for an increase of salary had been before the Finance Committee, who "made no recommendation." What the salary had been we do not know, but two proposals were put forward. The first was that it be *increased* to £60 a year for full-time work, and the alternative, which was carried, that it be £52 a year for five days a week. We do not wonder that the surveyor remarked that such remuneration was no encouragement to him in his work.

Traffic Factors.

By J. EASTWOOD, Assoc. M.Inst.C.E.

In order to consider the relative merits of various forms of road construction and to compare the results obtained on one road with the results obtained in another, it is necessary to have one standard of comparison of traffic. There are many difficulties in the way of fixing upon a simple universal standard, and there is a danger of arriving at a false and misleading simplicity by ignoring many vital points. It will, however, be a real step forward if there can be agreed upon a standard which will hold good even within a limited area. Such a standard could be pointed out by the author in the correspondence on Mr. J. Walker Smith's paper,* of great value to the engineer in considering the question of improving the roads within the area, by affording an index to the tendency and hence the relative cost of various kinds of road construction under given conditions of traffic.

At one time it was considered sufficient in taking a traffic census to count the vehicles passing in a given time, but it has long been recognised that such a method of enumeration is useless for comparing a mixed mass of traffic passing along a given road with a mixed and possibly very dissimilar mass of traffic passing along another road. The late Mr. C. F. Deacon proposed to reduce traffic to a standard of tons per yard width of roadway per annum, and this is a system which has been largely followed, the Form of Summary of Statistics of Traffic issued by the Road Board being based on this method. While this was a great advance on the previous method, it does not take sufficient note of the character of the traffic and of the road surface.

A little consideration will lead to the conclusion that many other factors besides weight have an influence in determining the destructive effect of traffic on road surfaces. To take an instance which occurred within the author's experience: On a certain road which was paved with granite on concrete foundation, and had a gradient of 1 in 22 to 1 in 13, there was considerable motor wagon traffic to a neighbouring factory, a motor wagon with steel tyres passing backwards and forwards frequently, usually with a full load on the down journey. Under these conditions the life of the granite was from two to three years only, the setts being crushed to pieces. The steel tyres were then removed and rubber ones substituted, with the result that the life of the paving was more than doubled, though the traffic in tons per yard width per annum was practically the same throughout the period. Again, compare the destructive effect of a motor car with steel-studded tyres travelling at a fast speed on a macadamised road with that of a heavy motor wagon with rubber tyres passing slowly along a paved road. Mr. Walker Smith in the paper previously referred to says:—

"It will no doubt be readily granted that on macadam surfaces a 10-ton traction engine will do more damage than ten units of 1 ton each, but again the extent of the relative damage will not be constant, as the extra damaging effect per ton of the heavier vehicles will decrease as the strength of the road increases, and, apart from questions of weight, all rubber-tyred vehicles—particularly those fast-running motor vehicles—will have a more detrimental effect upon the surface of a water-bound road than upon the surface of a bituminous-bound road. It would therefore appear to be necessary, in order to standardise traffic effects, to lay down coefficients of potential damaging effect."

To this it may be added, as a necessary corollary, that the vehicles mentioned will also have a more detrimental effect upon macadamised roads generally than upon paved surfaces. In correspondence on the paper, Mr. Walker Smith again reiterated that he did not agree that coefficients of potential damaging effect should be based on the intensity of weight on the road.

It is the aim of this paper to discuss the conditions influencing the value of coefficients of potential damaging effect, or, as some American engineers call them, "traffic factors," a term which the author has adopted as being not quite so cumbrous as the other. The author has already enumerated some of these conditions in the correspondence on Mr. Walker Smith's paper, in which he also quoted factors suggested by Major Crosby, chief engineer, Maryland Geological and Economic Survey (The Surveyor, vol. xxxix. (1911), p. 364), and the New York State authorities. It will be seen, therefore, that the author is not advancing any novel suggestions, but rather elaborating previous ones, particularly the combining of leading features of both the method of traffic factors and that of the standard of traffic per unit width, by dividing the total traffic number by the width of the road in order to allow for difference in width, as suggested in the above correspondence.

It will be evident that the ideal table of traffic factors will contain factors for each class of traffic on every kind of road surface, and under all variations of conditions which are seen to affect the value of such factors. Such an ideal table is naturally unattainable, and if attainable would be too complicated to be of value. The tables of the American authorities, above cited, refer only to ordinary macadamised roads, while the tables in Mr. Walker Smith's paper refer to such roads, and also to macadamised roads with bituminous binding. In the present paper factors are proposed for certain classes of traffic for both macadamised and paved roads. These values are such as the author's present experience lead him to consider suitable, but owing to the lack of sufficient data they are only suggested as tentative figures to be modified in the future as experience may indicate to be necessary, as it is apparent that a table of traffic factors must be an empirical one, and must be continually checked and readjusted as fresh data are forthcoming.

The following considerations will all bear on the question of the wearing effect of traffic on road surfaces:—

Road.—Surface formation, foundation, gradient.
Class of Traffic.—Weight, intensity of weight, description of tyres, speed, method of shoeing in the case of horses.
Weather Conditions.
Width of Road.

The method of arriving at suitable traffic factors for various classes of road surfaces is as follows: Typical roads are selected where the effects of foundation and gradient may be neglected, and it is found that, comparing macadamised surfaces in one part of these roads with paved roads of different kinds in other parts of these roads, and subjected, as nearly as can be judged, to the same traffic, the lives, say, of granite macadamised roads, York stone paving and granite paving are in the ratio of 1:2½:6. If then factors for the different kinds of traffic passing over these roads can be agreed upon, say, for macadamised roads, it becomes an easy matter to deduce from these factors for other classes of road surfaces, provided a reliable traffic census is available. In the supposed case it will not answer the purpose merely to alter all the factors in the same proportions.

* "Proceedings" Institution Civil Engineers, vol. clxxxvi., page 292.

The results of the census must be taken and the various factors adjusted by trial until the total traffic numbers in the various classes of roads are exactly as the actual numbers of the class of those surfaces. An example of the method is given in table 6 will make this clearer.

The question of road surfaces generally has been discussed in the preliminary remarks. A few other points affecting the factors may now be briefly referred to.

FOUNDATIONS.

Closely allied to the question of surface formation is that of foundation, and the destructive effects of heavy traffic—especially heavy traffic such as would be carried on the motor traffic with studded tyres, on macadamised roads without proper foundation are well known. There is another aspect of the matter which is perhaps not so well recognised, and that is the effect of a rigid foundation, such as concrete, in holding up the surface to the pounding action of fast-moving steel-tyred motors or similar heavy traffic. The road surface is then literally between the hammer and the anvil, and if the force of the impact exceeds the crushing resistance of the material the result is disastrous. For example, in the case of the granite road referred to earlier, where the sets were crushed as previously mentioned within two or three years. Similar cases occur with gritstone paving, even when not on concrete, provided the bed upon which it is laid is fairly solid.

The effect of a bad foundation cannot be allowed for in a standard table of traffic factors as the questions of degree and nature of defects then arise. The object in drawing attention to it here is to emphasise the fact that in gathering data for constructing such a table care must be taken that the observations are confined to roads where the foundations are such that the results will not be vitiated by them.

GRADIENT.

The damaging effect of horse traffic, in particular, is considerably increased by heavy gradients, the digging and pounding action of the horses' feet in drawing loads up the hill being very destructive of the road surface. On macadamised roads it loosens the surface and digs out the stones, while in wet weather the surface, being soft, is pounded to a pulp and the stones rounded in such a way that disintegration is very considerably facilitated. With paved surfaces the horses can only get a good foothold in the joints of the setts, and consequently wherever their shoes first strike the surface they slide downwards until they reach a joint, and the faces of the setts are soon so rounded that the horses can only obtain a foothold with difficulty.

In a particular instance York stone paving on a gradient of 1 in 9 had in twelve months worn down 1½ in. at the middle of the sett to 3 in. at the joint on the up side of a street in which on the down side the life of the paving was about four years. The up traffic was confined to one line, owing to metal plates having been placed for the wheels of vehicles to run upon, and consequently the whole of the above-mentioned wear was due to the horses' feet. The down traffic also tended to keep mostly in one line, as many of the vehicles had slippers on one wheel, and ground against the kerb with the other to act as a brake.

Generally speaking, in several cases where, owing to tramway lines in the centre of the road, or other causes, the traffic up and down roads having a gradient of 1 in 9 to 1 in 14 or so has tended to keep each to its own side, the life of paving on the up side has been from one-half to one-third of that on the down side, owing to this rounding of the setts.

In the accompanying tables an arbitrary division has been fixed upon at a gradient of about 1 in 14, and different factors are given for roads steeper and for roads flatter than this. It will be understood that there is no sharply defined difference between what happens on a gradient of 1 in 14 and on a gradient of 1 in 15. The effect due to gradient increases gradually as the gradient increases, and since the line must be drawn somewhere, it was thought fair to draw it at a gradient of 1 in 14, though this is entirely a matter of opinion, and it may be that this arbitrary division should vary with the nature of the road surface.

CLASS OF TRAFFIC.

The weight of vehicles, and more especially the intensity of weight, must have consideration in drawing up a table of traffic factors, as also must the speed at which the vehicle travels, as, other things being equal, a fast moving vehicle will do more damage than a slow moving one. Some authorities are of opinion that weight multiplied by speed would give a good basis for traffic factors for self-propelled vehicles, but this seems too severe upon light fast moving vehicles, though this, again, will depend somewhat on road surface, tyres, and so on. Since a vehicle is not always loaded up to its utmost capacity, nor always driven at its utmost speed, it is possible to attach too much importance to considerations of weight and speed. The influence of possible speed on the traffic factor will vary with the locality. On heavily trafficked urban or suburban roads a vehicle will not as often approach its speed limit as on a rural road, so that what seems to the town surveyor to be a suitable factor may appear unsuitable for a rural district.

It will scarcely be necessary to enlarge on the question of tyres, as it is plain that different tyres—rubber, rubber studded with steel, steel, and steel with transverse bars, as in traction engines—have widely varying effects on road surfaces.

In the case of horse traffic the damage to the road surface depends a good deal upon the method of shoeing. In many towns in the North having steep gradients, the horses, especially heavy horses, are shod in such a way as to give them a better foothold, and, incidentally, to damage the road surface much more than those which are flat shod. In summer they are shod with toe-bits at the front of the shoe and caulkers at the back. For a heavy carthorse the toe-bit is an oblong piece about ⅝ in. square and 4 in. in length, fixed across the toe, and the caulkers are about 1½ in. square, and project about ¾ in. from the face of the shoe. In winter the horses are shod with plug shoes, having four holes into which steel plugs can be driven. These plugs project ½ in. to ¾ in., and newly sharpened plugs are inserted on the appearance of frost. Should the frost be of short duration, followed by a quick thaw, the effect of these plugs, both on macadamised and paved surfaces, is very severe.

WEATHER.

Where the atmosphere is generally humid, and there is a considerable proportion of wet days, the damaging effect will be greater on roads generally, and particularly on water-bound roads, than in the case of a drier atmosphere and with fewer wet days. It is not so much a question of comparing rainfall as the number of wet days and the general humidity.

WIDTH OF ROAD.

The author proposes to allow for variation in width by dividing the total traffic number by the width of the road. If, however, the road is so narrow that there is only room for two lines of traffic, the effect of the traffic is greater than would be indicated by the ratio total traffic divided by width, owing to the surface becoming rutted. Cases which have come under the author's notice include one in which where granite paving, owing to this cause, had a life of two to three years only as compared with ten years with the same traffic

[illegible] ordinary conditions, and another in which a [illegible] passing had a life of four years as against [illegible] years under ordinary conditions further along the same road. This, however, is one of the best references for which special allowance must be made, and which is outside the scope of a general table.

It will be seen that the question of traffic factors is a complicated one, and one which can only be simplified by careful observations, continued over a long period. Unfortunately, this research is costly, and it would be difficult to persuade local [illegible] to use in this paper a traffic census was taken on two roads, "A" and "B," on July 25 and 26, 1911, the details of which are given in Table I. The width of "A" road between the kerbs is 49 ft., and of "B" road 34 ft., the life of granite macadam being three and a half years and three years respectively.

From a consideration of these traffic observations and the life of macadam in these roads, and from other data, a table of traffic factors (Table II.) has been drawn up. This table also gives the factors of the New York State authorities and those

TABLE I.—[illegible] on Roads "A" and "B" Roads.

July 25th and 26th, 1911.

"A" Road		a.m. 5.30 to 7.30	a.m. 7.30 to 9.30	a.m. 9.30 to 11.30	a.m. 11.30 to 1.30	p.m. 1.30 to 3.30	p.m. 3.30 to 5.30	p.m. 5.30 to 7.30	p.m. 7.30 to 9.30	Total 25th	Total 26th	Average
Led or rubber horses	25th	—	—	3	—	2	—	5	2	12	—	10
	26th	—	—	—	2	—	2	2	1	—	8	
Single horse vehicles light	25th	27	6	121	105	67	52	60	28	516	—	471
	26th	25	3	91	75	61	66	5	40	—	427	
Single horse vehicles heavy	25th	33	8	54	6	54	42	29	7	274	—	278
	26th	34	10	50	—	46	42	5	40	—	282	
Horse vehicles light	25th	—	—	—	1	1	1	—	—	6	—	6
	26th	—	—	—	—	1	1	1	—	—	3	
Horse vehicles heavy	25th	—	3	2	2	7	1	1	1	40	—	48
	26th	1	9	4	7	15	1	3	1	—	56	
Horse vehicles	25th	—	2	—	—	1	—	1	—	4	—	7
	26th	1	1	1	1	—	—	—	1	—	10	
Horse vehicles etc.	25th	—	—	—	—	—	—	1	—	6	—	3
	26th	—	—	—	—	—	—	—	—	—	—	
Motor cycles	25th	2	1	1	1	7	2	15	2	45	—	41
	26th	—	1	—	1	3	1	10	3	—	37	
Motor cars	25th	2	8	16	3	56	17	29	14	148	—	136
	26th	—	9	32	26	23	26	18	16	—	144	
Motor wagons rubber tyres	25th	—	2	3	—	2	1	1	—	18	—	16
	26th	—	1	1	1	1	—	1	—	—	14	
Motor wagons steel tyres	25th	—	—	1	—	—	—	1	—	2	—	1
	26th	—	—	—	—	—	—	—	—	—	—	
Traction engines	25th	—	—	—	—	—	—	—	—	—	—	—
	26th	—	—	—	—	—	—	—	—	—	—	
										1,051	983	1,017

"B" Road		a.m. 5.30 to 7.30	a.m. 7.30 to 9.30	a.m. 9.30 to 11.30	a.m. 11.30 to 1.30	p.m. 1.30 to 3.30	p.m. 3.30 to 5.30	p.m. 5.30 to 7.30	p.m. 7.30 to 9.30	Total 25th	Total 26th	Average
Led or rubber horses	25th	1	—	2	—	2	1	1	1	10	—	11
	26th	—	4	2	—	—	2	2	2	—	12	
Single horse vehicles light	25th	42	8	182	42	32	41	29	19	295	—	221
	26th	5	34	33	16	37	40	23	16	—	236	
Single horse vehicles heavy	25th	2	9	42	26	27	28	18	10	162	—	167
	26th	2	5	37	2	28	23	23	9	—	174	
Horse vehicles light	25th	1	2	3	1	—	—	2	1	11	—	8
	26th	—	—	2	2	—	—	—	1	—	5	
Horse vehicles heavy	25th	2	26	25	26	11	3	18	24	135	—	137
	26th	1	21	26	23	6	1	24	2	—	111	
Horse vehicles	25th	—	6	5	3	1	—	—	1	24	—	21
	26th	—	8	4	—	2	1	—	1	—	19	
Horse vehicles etc.	25th	—	1	—	—	—	—	—	—	1	—	1
	26th	—	—	—	—	—	—	—	—	—	—	
Motor cycles	25th					1	1	1	1	9	—	8
	26th	—	—	—	—	—	1	1	2	—	7	
Motor cars	25th	—	7	5	10	7	11	8	12	63	—	68
	26th	—	4	12	3	15	12	33	9	—	72	
Motor wagons rubber tyres	25th	1	—	—	7	7	3	3	1	35	—	23
	26th	—	—	—	1	6	6	2	—	—	30	
Motor wagons steel tyres	25th	—	—	—	—	1	—	1	—	1	—	1
	26th	—	—	—	—	—	1	—	—	—	2	
Traction engines	25th	—	—	—	—	—	—	—	—	—	—	
	26th	—	—	—	—	—	—	—	—	—	—	
										654	698	676

another for having charge of roads that it would be of sufficient value to repay the cost. It being essentially a matter of more than local importance, the accumulation of the necessary data might well be encouraged by the Road Board. In this connection it may be noted that in 1909 the Massachusetts Highway Commission (and Americans are not usually credited with a desire to spend money for nothing) expended over £900 in taking a traffic census, and the author is indebted to the secretary to the commission for a copy of the annual report of the commission for that year.

For the purpose of obtaining some figures for a Major Crosby. In each case the average traffic per day has been multiplied by its appropriate factor, and the "total traffic number" thus obtained has been divided by the width of the road. The result is what is here termed the "traffic intensity ratio" per foot of width. If the traffic intensity ratio for any road be multiplied by the life of the road surface the product would be the same for all roads if the traffic factors were suitable; hence this is a test of the suitability of the factors. In fact, if there were available sufficient data showing the average traffic throughout the year on a considerable number of roads, as

well as the life of the various classes of road surface on these roads, the traffic factors could be determined with absolute accuracy.

Table III. shows the total traffic number, the traffic intensity ratio, and the product of traffic intensity ratio × life of macadamised road for each of the above-mentioned tables of factors. It also shows similar results for Mr. Walker Smith's factors and the Road Board's factors, the last two being reduced to the same basis as the others by taking the led or ridden horse as unity. From this table it will be seen that the author's proposed factors and the New York factors give the most consistent results, but it is useless to dogmatise from these figures, as it is possible that a more extended traffic census might give very different results. There are available no other traffic figures with respect to "A" and "B" roads, but the following examples from the Massachusetts State Highway Census, previously referred to, show the variation of the traffic in August and October in a few cases in which the traffic averaged about the same as that on "A" road (Table IV.).

Taking the whole of the returns of that census, however, the variation was not so excessive (see Table V.).

From these figures it is apparent that a traffic census, in order to give reliable results, should cover a long period so as to show the seasonal fluctuations. On the other hand, the two roads "A" and "B" being main roads leading to a manufacturing town in the West Riding of York-

TABLE II. Table of Traffic Factors proposed by the Author for Macadamised Roads on the Level or Moderate Gradients. (The table also shows the total traffic number and the traffic intensity ratio for various factors.)

"A" Road.	Average traffic per day.	Author's traffic factors.	Product Traffic × factor.	New York factors.	Product. Traffic × factor.	Major Crosby's factors.	Product. Traffic × factor.
Led or ridden horses	10	1	10	1	10	1	10
Single-horse vehicles (light)	471	2	942	2	942	2	942
Single-horse vehicles (heavy)	278	4	1,112	3	834	2	556
Two-horse vehicles (light)	6	4	24	3	18	4	24
Two-horse vehicles (heavy)	48	6	288	4	192	4	192
Three-horse vehicles	7	7	49	5	35	6	42
Four or more horse vehicles	3	9	27	6	18	8	24
Motor-cycles	41	½	21	1	41	½	82
Motor-cars	136	8	1,088	4	544	20	2,720
Motor wagons (rubber tyres)	16	12	192	10	160	20	320
Motor wagons (steel tyres)	1	20	20	10	10	20	20
Traction engines	—	—	—	—	—	—	—
Total traffic number	—	—	3,773	—	2,804	—	4,932
Traffic intensity ratio	—	—	77	—	57	—	101
"B" Road.							
Led or ridden horses	11	1	11	1	11	1	11
Single-horse vehicles (light)	221	2	442	2	442	2	442
Single-horse vehicles (heavy)	167	4	668	3	501	2	334
Two-horse vehicles (light)	8	4	32	3	24	4	32
Two-horse vehicles (heavy)	137	6	822	4	548	4	548
Three-horse vehicles	21	7	147	5	105	6	126
Four or more horse vehicles	1	9	9	6	6	8	8
Motor cycles	8	½	4	1	8	2	16
Motor cars	68	8	544	4	272	20	1,360
Motor wagons (rubber tyres)	33	12	396	10	330	20	660
Motor wagons (steel tyres)	1	20	20	10	10	20	20
Traction engines	—	—	—	—	—	—	—
Total traffic number	—	—	3,095	—	2,257	—	3,557
Traffic intensity ratio	—	—	91	—	66	—	105

TABLE III.

	Total traffic number.					Traffic intensity ratio.					Product.—Traffic int. ratio × life of macadam road.				
	Author's factors	New York factors	Major Crosby's factors	Mr. Walker Smith's factors	Road Board factors	Author's factors	New York factors	Major Crosby's factors	Mr. Walker Smith's factors	Road Board factors	Author's factors	New York factors	Major Crosby's factors	Mr. Walker Smith's factors	Road Board factors
"A" Road	3773	2804	4932	4847	2927	77	57	101	99	60	270	200	352	347	209
"B" Road	3095	2257	3557	5165	2791	91	66	105	152	82	273	199	314	456	246

TABLE IV.—Extracts from Massachusetts State Highway Census.

Road.	August Census.		October Census.		Total October traffic as a percentage of total August traffic.
	Automobiles.	Horse-drawn vehicles.	Automobiles.	Horse-drawn vehicles.	
Weston	382	608	334	905	73 per cent.
Sangus River Bridge	1,177	124	640	75	53 "
Gloucester (South)	623	279	151	194	38 "
Barnstaple	469	686	126	304	45 "

shire, most of the traffic is business traffic and it is probable that the fluctuation due to varying causes will be small as compared for instance, with a road leading to a pleasure resort, and subject to heavy pleasure traffic during the summer; also, the two roads being subjected to similar traffic and both leading to the same town, any seasonal fluctuation will probably affect both roads, so that the relative figures, which alone affect the result, may not vary greatly throughout the year.

Accepting the author's factors in Table II. as a basis for macadamised roads on the level or moderate gradients, it is then possible to deduce from these factors for other gradients, and such other materials as are in use on the roads observed or similar roads. Unfortunately, the only figures available in addition to those for ordinary water-bound macadamised roads are for York stone paving and granite paving, and consequently the factors given are limited to these surfaces. Taking the life of these three surfaces to be in the ratio of 1 : 2½ : 6, as previously mentioned, experience seems to show that the life of each of them on steep gradients would average about two-thirds of their life on the level. Table VI. has been calculated on this basis, and is self-explanatory.

TABLE V.—Extracts from Summary of Massachusetts Highway Cases.

Division.	Total August traffic	Total October traffic.	Total October traffic as a percentage of total August traffic.
1	4,808	4,760	98 per cent
2	6,849	6,892	93 "
3	8,904	8,334	94 "
4	25,320	19,895	79 "
5	19,039	13,611	72 "
Total	64,900	52,932	82 "

The utility of tables of traffic factors, if they can be based on sufficient data, so that they can be relied upon, is obvious. For instance, if a census of the traffic on any road be obtained, by the use of the appropriate factors, the relative life of the existing road surface and of any proposed substitute can be calculated, and hence the difference in annual cost of the existing road surface and the proposed substitute.

TABLE VI. Proposed Traffic Factors.

—	Macadamised Roads.		York Stone Paving.		Granite.	
	Level.	Steep.	Level.	Steep.	Level.	Steep.
Led or ridden horses	1	2	½	1	½	½
Single horse vehicles light	2	4	1	1½	½	½
Single horse vehicles heavy	4	6	2	3	1	1
Two horse vehicles light	4	6	2	3	1	1½
Two horse vehicles heavy	6	9	3	4½	1	1½
Three horse vehicles	8	12	3½	5¼	1½	2¼
Four or more horse vehicles	9	15	4½	6¾	2	3
Motor cycles	½	½	¼	¼	0	0
Motor cars	8	8	1½	1½	½	½
Motor wagons rubber tyres	12	12	2	2	1	1
Motor wagons (steel tyres)	20	20	20	20	20	20

It is to be hoped that engineers in a position to do so will accumulate such data as may be useful for improving or verifying existing tables of traffic factors, and extending them to other classes of road surfaces. Mr. Walker Smith, in his paper previously cited, gives a very complete set of tables dealing with various classes of macadamised roads. They do not agree with the writer's results, as will be seen on referring to Table III., but this may be due to the writer's figures being based upon insufficient data.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

JUNIOR INSTITUTION OF ENGINEERS.

The council of the above institution have elected the Marquess of Graham as their president for the year 1914-15, in succession to Sir Boverton Redwood.

The Vickers Prize, consisting of a gold medal and premium of instruments or books, has been awarded to Mr. James Richardson, B.Sc., Assoc.M.Inst.C.E., for his paper on "High-power Diesel Engines. Their Development for Marine Service." Mr. Richardson has also been fortunate enough in securing the Institution Medal for the same paper.

The other awards of this institution have not yet been announced.

It is interesting to note the excellent progress made with the local sections in Birmingham, Manchester and Sheffield. The membership has been considerably increased during the year, and the committees of each section are arranging a full and interesting programme for the coming session.

"Pax."—We have received a number of inquiries with regard to this new insect destroyer, of which some particulars appeared in our issue of the 18th inst. (p. 365). Having at present no information beyond that embraced in our note, we suggest that correspondents should communicate direct with the company concerned, whose address is 14 Caxton House, Westminster, S.W.

Belper Rural District Roads. In his report for the year ended March 31st last, Mr. Robert C. Cordon states that the expenditure in connection with the maintenance of the 162 miles of roads under his charge as engineer and surveyor to the Belper Rural District Council has been kept within normal limits, notwithstanding greatly increased traffic, motor and otherwise. This, he considers, is a matter for congratulation, having regard to the fact that the greater part of the district may be classed as semi-urban, being bounded on the south by the county borough of Derby, on the east by the borough of Ilkeston and urban district of Alfreton, north by the urban district of Matlock, and north-west by the urban district of Wirksworth. The distance from the extreme points north to south boundaries, as the crow flies, is 15 miles, and east to west boundaries 12 miles. During the twelve months under review the expenditure on highways was £5,302, or a total of £35 3s. 10¼d. per mile; but deducting certain amounts paid to the credit of the council, the nett figures were £5,175 and £31 18s. 11½d. respectively. Some 6,300 tons of stone were consolidated with the steam roller, covering an area of 68,200 super. yds. of roadway, and showing a daily average of 350 sq. yds., with 32¾ tons of stone, each ton covering approximately 11 sq. yds.

PRO PATRIA.

[FOURTH LIST.]

In presenting a fourth list of municipal, engineering and sanitary officials who are taking part in the great war we repeat our request to readers to assist by notifying us of other cases within their knowledge.

Abbott, Thomas L., chief clerk to borough engineer and surveyor, Harrogate (Mr. C. E. Rivers, Assoc.M.Inst.C.E.), 5th West Yorkshire Regiment (Territorials), volunteering for foreign service.

Allan, G. J., engineering assistant, Southend-on-Sea, private, 2nd Battalion London Scottish.

Allaway, J., disinfector, health department, Gloucester, National Reserves.

Annear, R. W., assistant surveyor to the Watford Rural District Council, has enlisted in the 1st London (City of London) Sanitary Company R.A.M.C.T., and volunteered for foreign service.

Brown, D., switchboard attendant, Gloucester electricity department, 5th Battalion Gloucester Regiment.

Brown, J. A., assistant to the Birmingham city analyst, City Battalion.

Burriss, C. H., clerk, borough engineer's department, Southend-on-Sea, private, 1st Battalion City of London Fusiliers.

Cadoc, Bernard, pupil of the borough surveyor of Gillingham (Mr. J. L. Redfern) is serving as Lieutenant of the Kent Royal Garrison Artillery (Territorials), Slough Fort.

Canavan, J., Quartermaster-Sergeant, market toll collector, Gloucester, 5th Battalion Gloucester Regiment.

Chapman, A., clerk, borough engineer's department, Southend-on-Sea, lance-corporal, 1st Battalion City of London Fusiliers.

Chesterfield, B. F., assistant surveyor, Alton Urban District Council, with the Hants Territorials.

Clarke, Leonard H., A.R.I.B.A., second assistant to borough engineer and surveyor, Harrogate (Mr. C. E. Rivers, Assoc.M.Inst.C.E.), 5th West Yorkshire Regiment (Territorials).

Crabb, F. J., engineering assistant, Southend-on-Sea, sapper, Fortress Engineers.

Cullum, H. J., engineering assistant, Southend-on-Sea, 2nd Lieutenant, Royal Engineers.

Dale, Dr. J., assistant medical officer of health, Birmingham Corporation, Sanitary Officer, South Midland Division.

Day, E. E., clerk, Birmingham town clerk's department, South Midland Brigade Royal Field Artillery.

Essex, R. C., pupil, city treasurer's department, Gloucester, R.G.H.Y.

Everall, A., clerk, Birmingham town clerk's department, Royal Berks Regiment.

Falcon, L., engineering assistant, Southend-on-Sea, 2nd Lieutenant, 4th Queen's Surrey Regiment.

Fowler, O. K., switchboard attendant, Gloucester electricity department, R.G.H.Y.

Gladwell, Arthur Bennett, engineering assistant, Walton-on-Thames Urban District Council, with the South Midland Brigade, Army Service Corps. He has volunteered for foreign service.

Hadfield, L. E., clerk, Birmingham town clerk's department, Royal Berks Regiment.

Harpur, F., clerk, borough engineer's department, Southend-on-Sea, lance-corporal, 1st Battalion City of London Fusiliers.

Hartridge, N., pupil in the surveyor's department, Maidstone Rural District Council, with the West Kent (Queen's Own) Yeomanry. He has volunteered for foreign service.

Hill, J. R., clerk, Birmingham town clerk's department, South Midland Brigade Royal Field Artillery.

Hunter, J. K., assistant in borough engineer's department, Leigh, Royal Engineers.

James, J., assistant clerk, health department, Gloucester, 5th Battalion Gloucester Regiment.

Johnson, G. J., clerk, city surveyor's department, Gloucester, 5th Battalion Gloucester Regiment.

Kingscott, H. G., second assistant, city treasurer's department, Gloucester, 5th Battalion Gloucester Regiment.

Leggat, Dr. A., medical superintendent, West Heath Hospital, Birmingham Corporation, Lieutenant, 1st Mounted Brigade Field Ambulance, South Midland Division R.A.M.C.T.

Lightbody, Harold, pupil, engineer's department, Carshalton Urban District Council, with the London Rifles (Territorials).

Long, D. E., engineering assistant, Southend-on-Sea, private, 1st Battalion 1st City of London Fusiliers (Reserve).

Maulkinson, H. Y., surveyor to the Mablethorpe Urban District Council, with the 5th (Service) Battalion Lincolnshire Regiment.

Moffat, Miss, matron, Salterley Grange Sanatorium, Birmingham Corporation, matron, R.A.M.C.

Mott, B. G., engineering assistant, Southend-on-Sea, private, 1st Battalion 1st City of London Fusiliers (Reserve).

Pidgen, G., pupil, surveyor's department, Alton Urban District Council, dispatch rider, Royal Engineers.

Pidgeon, J. G., engineering assistant to the borough engineer and surveyor of Bootle, has joined the 6th Battalion King's Liverpool Regiment (Liverpool Rifles).

Rea, W. E., clerk, Gloucester electricity department, 5th Battalion Gloucester Regiment.

Roberts, F. A., clerk, Birmingham town clerk's department, South Midland Brigade Royal Field Artillery.

Roper, W. E., engineering assistant, Southend-on-Sea, private, 1st Battalion 1st City of London Fusiliers (Reserve).

Ross, G. E. H., second assistant, city surveyor's department, Gloucester, 5th Battalion Gloucester Regiment.

Sedgwick, D., assistant sanitary inspector to the Maidstone Rural District Council, with the West Kent (Queen's Own) Yeomanry. He has volunteered for foreign service.

Spring, Dr. D. M., medical superintendent, Little Bromwich Hospital, Birmingham Corporation, Captain, 1st Mounted Brigade Field Ambulance, South Midland Division R.A.M.C.T.

Tait, W. L., borough surveyor of Sudbury, Lieutenant, D Company, 5th Battalion Suffolk Territorials.

Thorby, P. G., engineering assistant, Southend-on-Sea, private, 7th Middlesex.

Torr, H. L., engineering assistant, Southend-on-Sea, private, 1st Battalion 1st City of London Fusiliers (Reserve).

Torrance, Dr. W. T., medical superintendent, Witton Hospital, Birmingham Corporation, Lieutenant, 1st Mounted Brigade Field Ambulance, South Midland Division R.A.M.C.T.

Ward, G. J., engineering assistant, Southend-on-Sea, private, 1st Battalion 1st City of London Fusiliers (Reserve).

Warner, P., late clerk, surveyor's department, Alton Urban District Council, with the Hants Territorials.

Warren, C. H. Noble, clerk, borough engineer's department, Southend-on-Sea, private, 1st Battalion City of London Fusiliers.

Weighill, F. W., clerk to borough engineer and surveyor, Harrogate (Mr. C. E. Rivers, Assoc.M.Inst.C.E.), with Royal Army Medical Corps.

Wicks, W. E., clerk, borough engineer's department, Southend-on-Sea, private, Oxford Light Infantry.

Wortley, R. K., engineering assistant, Southend-on-Sea, private, 1st Battalion 1st City of London Fusiliers (Reserve).

Mr. Eric F. Wettern, director of Wettern Brothers, Limited, has been accepted for service in the Engineering Section of the Royal Naval Division.

The Acceptance of Tenders. At a meeting of Prestatyn District Council on Monday Mr. E. T. Williams asked why the tenders of local contractors for pipe-laying had not been accepted when, in one case, the difference in the cost was only 4s. 6d. in £20. The surveyor said that the work was almost completed. Mr. Williams said it was most unusual that minutes of committees should be brought forward for confirmation when, owing to contracts having already been let, they had no option but to confirm them. Here was a case where they might decide to alter the committee's decision, and were unable to do so as the work was almost completed. He thought no contracts should be given out until the committee's recommendation was confirmed by the whole council.

BRIDGE BUILDING IN MIDDLESEX.

A BATH ROAD IMPROVEMENT.

The accompanying photographic views show the bridge which carries the main Bath road across the river Crane in the county of Middlesex. The existing structure is about to be demolished to make room for a new bridge with a carriageway of a much greater width than the present one.

The old three-arch bridge (erected about 1780, with its awkward road lines and somewhat steep gradients, will be taken down and replaced by a bridge of a more substantial design, as illustrated, for present-day traffic.

There will be two arches, instead of three as at present, with the necessary wing walls and approaches.

The width of the new bridge between parapets will be 50 ft. (in place of about 21 ft. as at present), with a carriageway 38 ft. wide (in place of about 19 ft.). The gradients of the approaches will be about 1 in 45, that portion of the carriageway crossing the bridge being practically level.

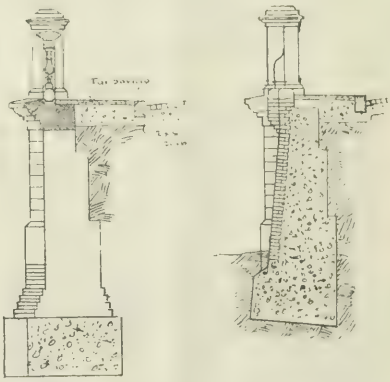
The new bridge has been designed by the county engineer, Mr. H. T. Wakelam, M.INST.C.E., and is being carried out by him, concurrently with other extensive bridge work which he has in hand in other parts of the county.

Old Cranford Bridge, Middlesex.

Carriageway of Old Cranford Bridge.

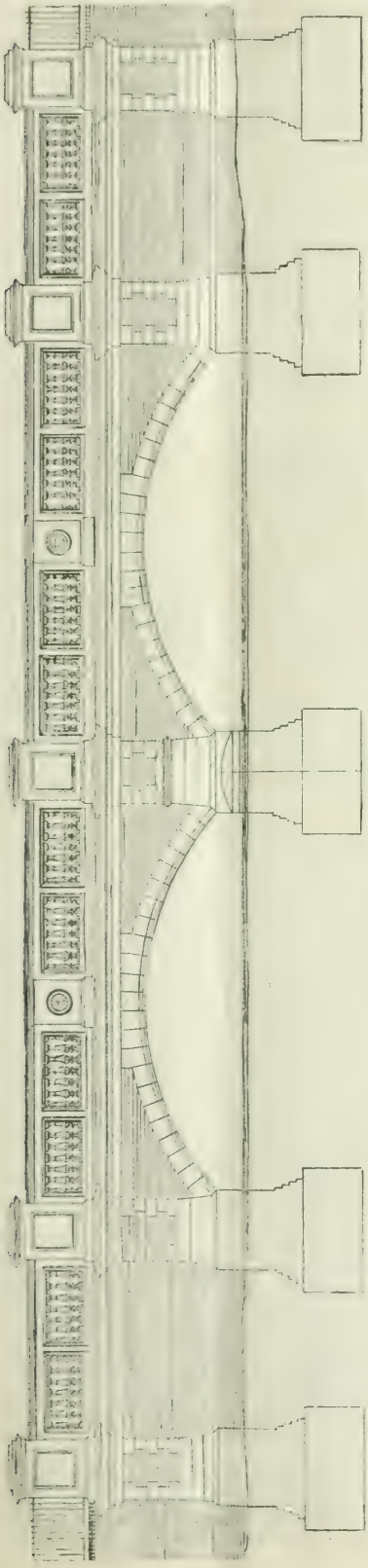
CHISWICK RIFLE RANGE.

The Chiswick Chamber of Commerce recently approached the Chiswick District Council, asking if they could loan them some building for the purpose of constructing a rifle range for the use of ratepayers during the continuance of the war. A special meeting of the Vacation Committee was held on September 7th, and permission was given to convert a large open corrugated iron cart shed adjoining the river depot stables. A sub-committee was formed, donations were made, and Mr. E. Willis, ASSOC.M.INST.C.E., the engineer to the council, acted as honorary surveyor and prepared a specification and drawings, obtained tenders and the necessary sanction of the War Office, and promised, if possible, to have the whole scheme in working order within three weeks. This has been done at a cost not exceeding £120. The rifle range was formally opened yesterday by the chairman of the Chiswick Council, Mr. James Leith, J.P. The whole of the work has been executed by local labour, and provision has been made for twelve targets, with full regulation distances at the firing points and a range length of 25 yds. It is intended to charge no entrance fee or subscription, any ratepayer, either male or female, being entitled to use the range at certain hours, the only condition being that the ammunition shall be purchased on the range.

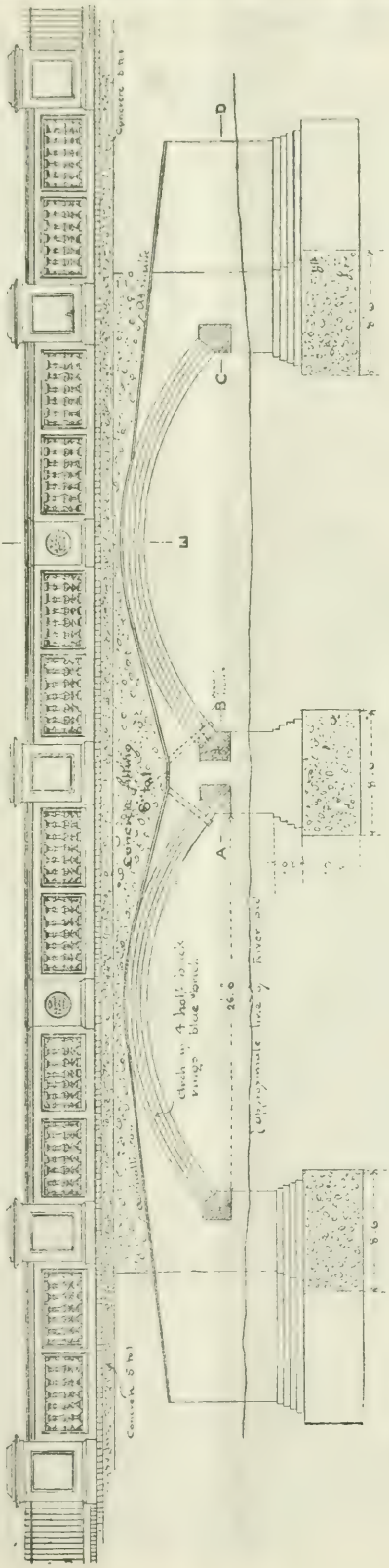


Section through Wing Wall. Section through Concrete Wall.

New Cranford Bridge.



Elevation.



Longitudinal Section.
NEW CRANFORD BRIDGE
(Mr. H. T. Wakeham, M.Inst.C.E., County Engineer, Lechlade.)

SEWAGE DISPOSAL AT LEEDS.

A YEAR'S WORK AT KNOSTROP.

[illegible] Mr. [illegible] A. Hill [illegible] [illegible] [illegible]

posal (2 parts per 100,000) in this respect, but it is admitted to be rather too high in suspended solids viz., 3·9 as compared with 3 parts allowed by the proposed standard. Of about fifty samples of filter-bed effluent examined, only 10 per cent were putrescent in four days at 80 deg. Fahr. The fixed jets each plugged up on an average eighteen times in 330 days, which is considered to be an excellent result, and to show that it is practicable to treat Leeds tank effluent after chemical precipitation by means of fixed jet distributors without incurring practical difficulties by jet plugging with solid matter.

Summarising the results of the three methods of applying chemically precipitated tank effluent to a percolating filter 6 ft. deep by continuous flow and intermittent flow in dosing, the following results have been obtained over the last 2½ years:—

(Parts per 100,000). Rate of Treatment:—200 gallons per square yard per day.

Method of application.	Period of time of experiment.	Percentage purification calculated on			Oxygen absorbed from solution in 4 hrs.	Nitrogen as nitrates.
		Albuminoid ammonia.	Oxygen absorbed in 4 hrs.	Suspended solids.		
1. Continuous flow ...	October 28, 1911, to April 17, 1912	63·7%	69·9%	59·8%	·38	1·51
2. Dosed for 16 hrs., resting 8 hrs.	April 24, 1912, to April 30, 1913	64·5%	64·1%	60·0%	·46	1·21
3. Dosed for 12 hrs., resting 12 hrs.	May 14, 1913, to April 30, 1914	66·9%	60·3%	60·2%	·50	·58

These results prove that, as the dosing period is reduced, the effluent slightly deteriorates in quality. This is most noticeable in the nitrification of the effluent, but it still remains non-putrescent. The intermittent dosing possesses the advantage that it has been proved to counteract the difficulties which arise in continuous dosing by growths appearing to a large extent on the surface. This is effectively prevented by intermittent dosing, and therefore it has been proved to be possible to treat a larger volume of sewage by intermittent dosing than by continuous feed, the difference amounting to not less than 10 per cent, owing to the frequent rest period necessitated to check the growth forming upon the filters by continuous feed.

The results obtained from dosing for a period of sixteen hours and subsequently resting eight hours are distinctly better than the results obtained from dosing the bed twelve hours and resting twelve hours, the advantage being about 4 per cent in purification on the albuminoid ammonia and oxygen absorbed figures, and almost 20 per cent in the suspended solids figure, the amount of nitrates and nitrites in the effluent being much in favour of a two-thirds dosing time and one-third rest when compared with a half dosing time and a half rest.

These experiments have been of the highest value to the committee in enabling them finally to determine from experience the best method of application of tank effluent to the continuous filters by means of fixed jets, and this branch of research work can now be regarded as having been determined.

A Useful Sanitary Service.—The mobilisation of the Territorial Force and the active recruiting for the Regular Army have led in London, as probably elsewhere, to the concentration in buildings of large numbers of men who as a result are in some instances, perhaps often, inadequately supplied with the opportunities for personal cleanliness to which they have been accustomed in their own homes. To meet this temporary difficulty (says the *Lancet*), a number of the London sanitary authorities have permitted soldiers in uniform to make use of the public baths in their districts without charge. In some instances, where uniform has not yet been provided, the written statement of an officer has been accepted that those wanting baths belong to the military force, and again the assurance of the recruiting officer has enabled recruits to be cleansed before being medically examined. This is a valuable service which deserves recognition, and it would be a great gain if the action of the city and borough councils in London, who have thus aided the military authorities, were extended throughout the whole of the county of London. Indeed, why should not these opportunities for cleansing be made available in all districts for soldiers and recruits, whether with or without uniform?

TOWN PLANNING IN THE UNITED STATES.*

By C. Mulford Robinson,
Rochester, N.Y.

American city planning seems clearly to be getting away from the draughting board, or, rather, the draughting room is no longer its central office. The planner of towns must often have recourse to his draughting table, of course, however many the hours he spends at his desk, in his library, or on the streets; but there was a time not so long ago—when a city plan, as understood in America, was a thing of star-points that sang together in unison, as a firmament showing his handiwork; of French curves; of quadrigas, pylons, and fountains; of temples and palaces, suggesting dreams of a prix-de-Rome.

To-day, if one may judge by the published plans of the last eighteen or twenty months, city planning is not a showy affair, but a sober one. It requires thoughtful discussion, not wonderful pictures; it has more to do with laws and ordinances than with architectural compositions, and the manner of presentation is not as important as the matter. In short, not fine books, but better cities and towns is the goal. There is more consulting of responsible officials, and the whole thing is coming down to earth out of the roseate clouds.

For all the much criticised standardisation of the earlier American street plans, the town planner, more on the lookout for differences than likenesses, finds each problem a new and fresh one, demanding original solution. Whatever there may be to fear in the town planning wave that to-day is sweeping the United States, the bogey of a loss of town individuality cannot yet justify an anxious thought.

Once this is duly recognised, it is interesting to note that the emphasis which at first was on civic centres and then on park systems, seems in these latest reports to be setting strongly toward concern for circulatory problems. The convenient handling of street traffic in main highway systems, and after that a more efficient development of railroad terminals, are subjects that each report takes up with earnestness. This is in response, no doubt, to the growing congestion of all kinds of traffic, and especially to that expansion of street traffic which has come with the automobile. The modern town is confronted by new conditions in the street traffic's speeding up, its growth in volume, and its increase in complexity. As to the emphasis of the future, if one may venture a guess from the signs that are given in these late reports, it is to be on industrial efficiency, on harbour improvement, and on housing. The latter, which in the British Isles is considered so earnestly, in the United States has only just begun to be thought about.

Since each change of emphasis carries standards higher, so that thereafter there is no slipping back to the old neglect, the American town plan of the near future should be an exceedingly comprehensive and well-rounded study, in which civic centres, parks, and recreative provision, traffic accommodation, transportation, industrial efficiency and better housing will each have due consideration. The only danger, if danger it may be called, is that the standard will be placed so high that no single town planner, and no single town plan, will venture to attempt so much.

Meeting Postponed.—As we go to press we learn that the projected meeting of the Royal Sanitary Institute at York on the 24th inst. has been postponed.

* Extracts from paper read at the annual general meeting and conference of the Institution of Municipal and County Engineers at Cheltenham.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to the Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Competitors are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for September is awarded to

Mr. N. S. Jeffery,
24 Westbrook Villas,
Darlington,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

The usual answers are invited to the following questions.

424. Mechanics.—Distinguish between kinetic and potential energy, and show how they are measured in the case of a body falling from rest. Show that, if a body be let fall from rest, its energy remains constant till it reaches the ground.

425. Strength of Materials.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength.

426. Geodesy.—Give a formula for computing the difference in height between two stations by means of the observed heights of the barometer, and state the meanings of the symbols used.

427. Testing Drains.—What tests should be applied to house drains before being passed? Describe any apparatus used.

428. Building Construction.—Draw a section through the eaves of a tiled roof, 45 deg. pitch, on a 14-in. wall. Show all details, including laths, sprockets and guttering.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

422. Building Construction.—The earth in front of a semi-basement to a house has to be supported for a depth of 6 ft. Give a section of a suitable retaining wall, and prove its stability by a graphic diagram.

Fig. 1 represents the section of the wall, and Fig. 2 is the graphic proof of its stability. In Fig. 2 we

Fig. 1.

consider only that portion of the wall which is above the lower ground line, as it would be a point F on the lower ground line, about which the wall would tend to turn. Many tables give the weights of brickwork and earth to be about the same, and as the wall is to be of brick, we can consider its section to be AGEF, the weight of the section of earth BGDC rests upon CD.

Draw EH = angle of repose = 34 deg. From G draw GJ, so that angle JGE = 2×34 deg. = 68 deg. From point J, and with JE as radius, draw semi-circle ELK.

Draw JL at right angles to EK. With centre E

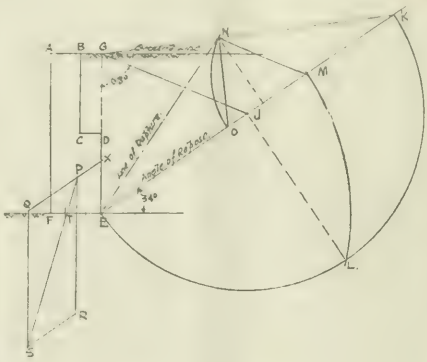


Fig. 2.

draw arc LM. From M draw MN parallel to JG. With centre M, and radius MN, draw arc cutting KE in O. Join OH.

Now triangle ONM is called the "pressure triangle" that is to say, its area multiplied by the weight of a cubic foot of earth represents the pressure of the wedge of earth 1 ft. wide between the line of rupture YE and the face GE.

It should be noted that this particular construction is inapplicable to angles of repose above 45 deg., when another construction has to be resorted to.

We must now find the weight of the wall acting through the centre of the wall, as we are considering the section BG DC to be part of it; also the weight of the earth retained as given by the "pressure triangle." This force acts through a point × ⅓ GE from the bottom, and parallel to the angle of repose (this takes into account the friction between the earth and the wall; otherwise it would be horizontal).

Weight of wall = W = 1′ 10½″ × 6′ × 112 lb. = 1,260 lb.

Weight of earth = P = $\frac{2'11 \times 3'6'' \times 112}{2}$ = 571 lb.

Note. Take the weight of cub. ft. of brickwork & of earth = 112 lb.

Now draw from the point P, which is the intersection of the lines of action of the two forces, PQ = 571 lb. to some scale, and PR = 1,260 lb. to the same scale. Complete the parallelogram QPRS, and we get the resultant of the two forces PS cutting the base of the wall at T within the middle-third of the base. This is necessary, else "creeping" will occur at E, owing to the back of the wall being in a state of tension. (N. S. J., *Darlington.*)

423. Sewer Construction.—Show by sketches (plan and section) the junction of a 3-ft. and a 5-ft. brick barrel sewer.

The annexed sketches give the plan, cross-section and longitudinal section required. The drawings

The Surveyor

And Municipal and County Engineer.

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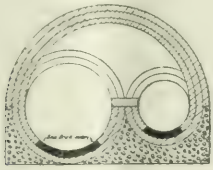
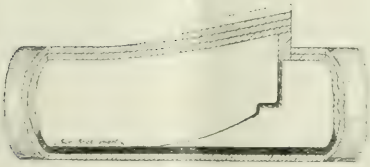
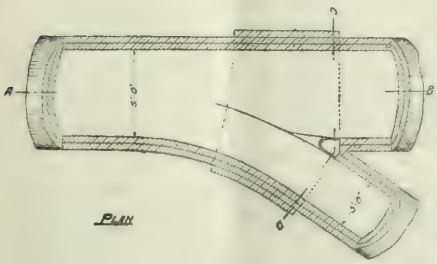
show the sewers as being constructed in two half-brick rings, and at their junction an additional half-brick ring is added to form an outer binding or "thimble." In the longitudinal section AB the top of this "thimble" is seen dotted, because the section is taken through the vertical diameter of the



SECTION CD



SECTION AB



PLAN

5-ft. sewer, which is not in the centre of the cross-section CD. To avoid a rough edge at the junction, and to form a good bond, a bull-nosed granite sill is fixed as shown. A blue-brick invert is shown to each sewer, and the intervening space between the top of the 3-ft. sewer and the under side of the 5-ft. sewer is filled up with 9-in. brickwork, as shown in the two sections. The under sides of the sewers are filled in with concrete. (T. W. P., *Bexhill-on-Sea.*)

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.
—Massinger: "The Fatal Dowry," Act ii., 2.

NOT GERMAN.

To the Editor of The Surveyor.

Sir, We should be very grateful if you would publish the subjoined copy of correspondence between a corporation and ourselves.—Yours, &c.,

(For Wettern Brothers, Limited),
Herbert L. Wettern, Director.

16 Water-lane,
Great Tower-street, E.C.

* * * *

[copy.]

City Engineer's Department,

September 23, 1914.

Gentlemen,—I am in receipt of your letter of yesterday's date. Before I go any further into this matter, I am requested by the committee to ask you to be good enough to let me know who are the shareholders in your firm.

It is believed that your business is run principally with German money.

You can quite understand that, with present conditions, we English people are anxious to give preference to firms employing British labour and financed by British capital.

Perhaps you will kindly let me have this information.—Yours truly,

City Engineer.

To Messrs. Wettern Brothers, Limited.

* * * *

City Engineer,

Dear Sir,—On behalf of my firm, I reply personally to your letter. Any accusation that our business is run principally with German money is absolutely unjustified and unfounded. Were such a statement to be publicly made, we should without compunction bring an action, so that the whole of our books, deeds and statements could be publicly proved and examined by the Court, in order that any such German stigma could be forthwith refuted.

History.—The history of our firm is as follows: My grandfather (maternal)—Mr. Blichfeldt—a Norwegian, founded this business in 1851. My father, who succeeded him in 1882, naturalised himself the same year (1882), and thereby became a British subject. He died in 1902. My two brothers are associated with me, and we are all born and bred Britishers, and have never lived out of England. In 1911 the business we had succeeded to as Blichfeldt & Co. we turned into a limited liability company, under the name of Wettern Brothers, Limited.

Directors and Shareholders.—The enclosed, which can be verified at Somerset House, sets out in full the directors and shareholders in our business. All the gentlemen holding shares are our employees here, who have been with us a number of years. Needless to say they also are all Englishmen.

Shareholders.

Herbert L. Wettern (Director).
Fred. R. Wettern (Director).
Eric F. Wettern (Director).
Mrs. R. M. Wettern.
A. Percy Beaumont (Secretary).
Geo. H. Jeff (Accountant).
John Wm. Penny (Manager).
John Palmer (Manager).
Alfred A. Bradley (Assistant Accountant).

Our Trade.—We have interests as quarry owners and agents in Cornwall, Scotland, Norway, and Belgium. We have no German trade or interests, and

are thankful to say we have not a friend (personal or business) in Germany.

Capital.—There is not one penny of German capital or even of foreign capital in our business, and there never has been. It is entirely British, being in our hands and put up by ourselves.

If there is any further information I can give you I shall welcome your enquiries. I should be quite willing to appear before any of your committees should you wish it, to answer any further questions or to refer you to solicitors, bankers, mayors or engineers of other boroughs and councils who have dealt personally in business with us since we started. . . .

May I ask you to read or send this letter to your committee, so that we may know no reply.—Yours faithfully,

(Signed) Herbert L. Wettles.

PREMATURE BURIAL.

To the Editor of The Surveyor.

Sir,—With reference to the "grim possibility of being buried alive" alluded to in your excellent leading of 18th inst., I say that of all the existing risks to life from a humane point of view, a more important than that for the prevention of burying people alive? To those who have not studied the facts, and to others who are sceptical as to the existence of trance, catalepsy, or other death-simulacra, sometimes known as human hibernation, such a movement appears unnecessary, Utopian, and a waste of energy. On the other hand, those who have carefully examined the evidence brought together by numerous authorities, including professors of medicine, hospital surgeons, and scientific observers, lose their scepticism in the amount of cumulative evidence which besets the path of their researches. Narrow escapes from interment alive, it may be truly said, are almost of everyday occurrence all the world over (especially in countries like France, Spain, Portugal, Italy, Russia, and Turkey, where apparent death is more frequently followed by prompt burial than in these islands), the discoveries often being accidentally made during the preparations for the funeral. It may be reasonably inferred from these cases that some, if not many, do not escape, and are buried while in a state of suspended animation. This catastrophe is most likely to occur on the battlefield, and it is much to be feared that many a wounded soldier is buried alive.

Every session the Association for the Prevention of Premature Burial presents to Parliament a Bill to prevent these terrible tragedies by reforming the present very haphazard, unscientific, and dangerous system of death examination and certification. Free literature on this momentous subject will be sent on receipt of a stamped addressed envelope.—Yours, &c.,

Jas. R. Williamson.

100 Chedington-road,
Upper Edmonton, N.
September 24, 1914.

Pudlo.—The architects for the Sedbergh Grammar School swimming baths, which have just been completed, speak very favourably of the efficacy of Pudlo in the treatment of the cement for these baths. There has been no trouble since they were built, either of the ingress of soil water or seepage.

Edinburgh Road Improvements.—Several important road improvements are being carried out under the direction of the Edinburgh city road surveyor, Mr. Sim. The widening at West Savile-terrace in conjunction with the widening at Blackford-avenue and Charterhall-road is well advanced. The work at Blackford-avenue is completed, and the corner has been taken off Charterhall-road, which will allow of the road being widened at this point westwards to a width of 60 ft. At West Savile-terrace the filling up necessary to the diversion is almost completed, and when this is done this road and Charterhall-road will be one continuous line. At Milton-road great improvements have been made and projected, some of them being caused by the new Lothians Railway line. Seafield-road is being raised from a point near the level crossing at the Old Loaning to a point about ½ mile further along, to allow of two overhead bridges being built so that the necessity of having level crossings will be done away with.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is there any accounting for tastes? Is it not strange that so many young and active men should prefer to act as guards and in other capacities on our tubes and underground railways instead of serving their country in the field? Surely a soldier's life is much more healthy, and the risk of death cannot be greater.

* * * *

Is it not very satisfactory to hear that so many young members and students of the Institutions of Civil, Mechanical, and Electrical Engineers have joined the new Divisional Engineer Units and Signal Company of the Royal Naval Division recently formed by the First Lord of the Admiralty? Is it not splendid the way in which the upper and middle classes of this country have responded to the "call to arms"?

* * * *

Will not the training received by the men who join the above-mentioned corps be of the greatest value to them even if they should not be called upon to go to the front? Would not the knowledge they will acquire of "men and materials" be of incalculable value to them in after life, when they again resort to "civil" practice?

* * * *

Is there not much food for thought in Mr. Bertram Kershaw's excellent article in the issue of The Surveyor of the 16th ult.? Does he not rightly point out that the freedom from sickness among soldiers in the field is very much due to the greater individual knowledge of the soldier to the needs of personal sanitation, and does not this equally apply to all civil populations? Is not sanitary "education" of even more importance than "sanitary legislation," and "personal cleanliness" of the soldier of more importance than "General Regulations"?

* * * *

Is it a fact that in some districts in England where there has been a great influx of troops and recruits difficulties are being experienced with regard to the water supply, and even the sanitary arrangements? Where this is the case could not some well-known engineer of experience at once be called in by the War Office, or the responsible department, to investigate these cases and report on any temporary remedial measures that might be taken?

* * * *

What is to be done with the German prisoners, of whom there are already a great number in this country, and of whom we hope to "welcome" more before we have done with Germany? Could they not be employed on some useful national works of land reclamation, or similar improvements? Can they be kept in health otherwise if they are obliged to lead idle lives during the term of their imprisonment? Are not the Germans making their prisoners work very hard on various useful works?

* * * *

Could not the members of local authorities, where they have not already done so, arrange for meetings of their constituents, and give them a series of addresses on the reasons why this country was obliged to go to war? Is not such explanation badly needed in some parts of the country?

* * * *

Who can read that magnificent poem "The Day" without being stirred to his inmost heart by its genius and beauty? And when we realise that it was written by a railway porter at Bath, Mr. Henry Chappell, can we not understand the well-known saying that "War always brings out the best in every man who has got any 'best' about him"?

A Glossary of Road Terms (By H. Percy Boulnois, M.Inst.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bath T.C. (September 22nd. Mr. Edgar Dudley). £18,000 for the purchase of leasehold interest in the Grand Pump Room Hotel and the freehold of certain properties adjoining. It was asked that the period of repayment of the proposed loan should be thirty years. The Pump Room Hotel, it was stated had been closed for a long period, and the property as it now stood was a blot in the centre of the city, and the corporation lost directly and indirectly in many ways.

Clayton West U.D.C. (September 24th. Mr. R. G. Hetherington). £9,739 for a sewerage and sewage-disposal scheme. Mr. A. Brook Hirst, of Huddersfield, described the scheme and said that the council were entitled to take credit for the fact that they had already expended out of current rates nearly £1,000 on account of sewerage improvements made in anticipation of the present scheme. The inspector said it was the desire of the authorities in London to facilitate this and other similar schemes in order to alleviate the distress caused by unemployment.

Kidderminster R.D.C. (September 23rd. Mr. F. O. Stanfordi). £1,500 for a water supply scheme for Wribbenhall. It was explained that the council had arranged with Bewdley Town Council to take water in bulk at 4½d. per 1,000 gallons, the Bewdley waterworks being in Wribbenhall parish and the main passing through the village.

Marsden U.D.C. (September 8th. Major J. Norton). £7,384 for the purposes of sewage disposal.—The inspector said the scheme was an amended one, and he understood the council wished to use unemployed labour in carrying out the work. The clerk (Mr. J. W. Piercy): That was a suggestion of the West Riding Rivers Board, but the council wish to have the work done by contract. Mr. A. Robinson (chairman of the council). Most decidedly. There was little unemployment in Marsden, Mr. Robinson added, though mills were working short time. Dr. Wilson (chief inspector of the Rivers Board) said they did not wish to dictate to the council, but their suggestion regarding the use of unemployed labour was made on receipt of a circular from the Local Government Board. Perhaps the inspector would say that the plans were generally likely to be approved, and then the contracts could be prepared and no time lost in getting the work done during the winter. The inspector: We shall not delay the scheme five minutes as soon as we get the information we want. The inquiry then closed.

Plymouth T.C. (September 22nd. Mr. P. M. Crosthwaite). £1,900 for the provision of railway siding accommodation on the Prince Rock estate.—Mr. J. Paton, borough surveyor, submitted drawings and plans of the scheme, and it was explained that the proposed siding would provide access for cattle for transport purposes, a convenience much required; also for general purposes it would be convenient in connection with the whole estate of the corporation, for instance, in regard to the conveyance of stone for highway purposes. Further, it would be available for the electricity works.

St. Albans T.C. (September 11th. Mr. W. M. Cross).—£48,977 for works of sewerage and sewage disposal in connection with the extension of the city of St. Albans, and £489 for the provision of public conveniences.—Mr. H. Howard Humphreys submitted details of the scheme and the alterations that it is proposed to make at the sewage farm to deal with the sewage from the extended area. It was intended, he stated, to drain a population of about 7,000 extra persons to the works, and the population of St. Albans itself had increased, so that the scheme covered rather more ground than was covered by the estimate of £45,250 mentioned at the city extension inquiry. The old city was sewered almost entirely upon the separate system, and that system would be followed in the added area, the intention being to exclude all surface water from the foul sewers. The gradients throughout the scheme were very good; the only part that could be thought at all flat was that from the golf links to the purification works. He did not, however, anticipate any trouble there. The sewage would be treated by double filtration throughout, and the sludge would be used upon the land as at present. In answer to Mr. A. J. Hampton, of the Thames Conservancy, Mr. Howard Humphreys said that no storm water overflow was proposed. In answer to a question by the inspector, Mr. A. Eade, manager of the sewage farm, said that at present the pumps were working about eighteen hours a day. Previous to the troops coming to St. Albans they were working about seventeen hours. In winter they were sometimes running full time, but the average was twenty-one hours.

Sedbergh R.D.C. (September 24th. Mr. R. G. Hetherington).—£911 for the purpose of providing a water supply from Millbeck Spring for the village of Dent.—It was explained that the cost would probably be increased, as materials had become enhanced in value of late. The clerk to the council said the majority of the Dent ratepayers were opposed to the scheme, as it would only benefit the people living in the village itself. But the opposition seemed to have come to the conclusion that the establishment of the scheme was a foregone conclusion, and offered no formal evidence.

South Dublin R.D.C. (September 24th. Mr. A. D. Price).—£1,500 for the purpose of providing water supplies at Knocklyon and at Rathfarnham.—Mr. T. J. Byrne, clerk and engineer to the council, said the intention was to get a supply of water from the Rathmines system and make the connection at Ballyboden. There was a recommendation from the medical officer of health as to a necessity for an ample supply of water in these portions of the district. It was proposed to borrow the money from the Commissioners of Public Works, to be repaid in thirty years, the contributing district being the rural area. The inspector asked if this scheme would complete the water supply to the whole rural district. Mr. Byrne said there was an area in Chapelizod which stood in need of a supply, but that question was not in contemplation by the council at present.

Stourbridge U.D.C. (September 16th. Mr. R. H. Bicknell). £400 to purchase property at the junction of New-street and Bell-street for street improvements, and £650 for the provision of public conveniences.—The surveyor, Mr. F. Woodward, submitted the necessary evidence with respect to both schemes.

Swansea T.C. (September 22nd. Mr. A. G. Drury).—£10,000 for the extensions of water mains, and £629 for widening Dolfin Bridge, Morriston.—It was explained that the Local Government Board had in 1913 sanctioned the raising of a similar sum for prospective extensions of the water mains covering a period of three years, but this had been expended sooner than was anticipated. With respect to the proposed bridge widening, the proposal was for the corporation to pay the cost of widening the bridge to 33 ft., including a 7-ft. footpath, the Great Western Company at the same time to carry out a lengthening at an estimated cost of £354.

APPLICATIONS FOR LOANS.

Barrowford U.D.C. — £2,200 for private street works.

Beverley R.D.C.—£10,000 for draining the villages of Ellloughton and Brough.

Bispham U.D.C.—£12,000 for private street works.

Brighton T.C.—£15,000 for the Loder-road school.

Coventry T.C.—£25,005 for the erection of a technical school, and £10,150 for school extension.

Edmonton U.D.C.—£1,250 for road widening.

Enfield U.D.C.—£2,820 for the erection of lodges and public conveniences.

Harpenden U.D.C.—£331 for sewerage works.

Hayward's Heath U.D.C.—£500 for laying a portion of the new cemetery.

Holmfirth U.D.C.—£7,150 for a new reservoir.

Jarrow T.C.—£5,200 for the Field-terrace improvement.

Merthyr T.C.—£250 for the construction of a bowling green.

Okehampton T.C.—£105 for works of water supply.

Oswaldtwisle U.D.C.—£2,213 for works of water supply.

Penzance T.C.—£5,385 for a housing scheme.

St. Annes U.D.C.—£6,500 for open-air sea-water baths.

Sandown U.D.C.—£245 for road improvement.

Staines U.D.C.—£1,100 for private street works.

Sutton (Surrey) U.D.C.—£1,000 for road reconstruction.

Westbury R.D.C.—£5,000 for the erection of workmen's dwellings.

LOANS SANCTIONED.

Abergele U.D.C.—£260 for works of sewerage.

Barnsley R.D.C.—£1,728 for sewerage works.

Barrow T.C.—£13,261 for a new school.

Belfast T.C.—£1,130 for sewerage extensions.

Blaenavon U.D.C.—£12,000 for a housing scheme.

Bournemouth T.C.—£60,000 for a pavilion on the sea front.

Brighton T.C.—£8,000 for the purchase of 164 and 165 Western-road for the purposes of street improvement.

Briton Ferry U.D.C.—£1,800 for laying out a public park.

Castlebar U.D.C.—£3,000 for works of water supply.

Clones U.D.C.—£2,700 for works of drainage.

Cosford R.D.C.—£500 for water supply works at Whatfield.

Gravesend T.C.—£1,615 for street improvements.

Kettering Joint Hospital Board.—£1,500 for constructional works.

Launceston T.C.—£5,000 for workmen's dwellings.

Liverpool T.C.—£4,642 for road widening, £997 for a new footpath, and £20,679 for the erection of a school.

Mansfield T.C.—£2,200 for street improvement.

Newbury T.C.—£4,000 for works of wood paving and concrete foundations, and £225 for automatic raking gear at the pumping station.

Penybont R.D.C.—£8,494 for a drainage scheme.

Tilbury U.D.C.—£4,960 for the purchase of land for housing purposes, South Ward; £2,630 for street works; £3,125 for surface-water drainage, sewers, and channelling; £654 for land for a new depot; £1,594 for land for additional allotments; and £3,890 for land for public walks and pleasure grounds.

FORTHCOMING INQUIRIES.

OCTOBER.	£
5.—**Exeter.** For road improvement (Mr. W. O. E. Meade-King)	4,100
5.—**Swaffham.** For the provision of working-class dwellings (Mr. H. A. Chapman)...	1,238
6.—**Conway.** For works of water supply (Mr. P. M. Crosthwaite)	3,120
6.—**Ramsbottom.** For works of sewage disposal (Mr. A. G. Drury)	1,081
6.—**Stamford.** For the provision of cottages (Mr. H. A. Chapman)	4,071
6.—**Turton.** For the electricity undertaking (Mr. H. R. Hooper)	3,569
7.—**Grays Thurrock.** For works of surface water drainage (Major J. Stewart)	1,500
7.—**Great Driffield.** For the provision of a hospital (Dr. W. W. E. Fletcher)	13,125
7.—**Hoylake.** For road widening (Mr. F. H. Tulloch)	2,100
7.—**Newquay.** For sewerage and street works (Mr. W. M. Cross)	2,900
7.—**Rhyl.** For the reconstruction of the amphitheatre (Mr. P. M. Crosthwaite)	4,000
7.—**St. Annes-on-Sea.** For the erection of sea-water baths (Mr. A. G. Drury) ...	6,500
7.—**Sheffield.** For works of sewage disposal (Mr. R. G. Hetherington)	70,000
8.—**Ivybridge.** For works of water supply (Mr. W. M. Cross)	4,000
8.—**Oldham.** For the provision of a depot and street widening (Mr. F. H. Tulloch)	3,266
9.—**Bradford.** For the provision of an infirmary (Dr. W. W. E. Fletcher) ...	100,000
9.—**Burnham.** For works of sewerage and water supply (Mr. W. M. Cross)	3,458
9.—**Denton.** For street improvement (Mr. F. H. Tulloch)	3,822
TOWN PLANNING.	
14.—**Ruislip-Northwood.** (Mr. George L. Pepler)	—

THE WAR.

LOANS TO LOCAL AUTHORITIES.

Immediately on the outbreak of war the Local Government Board, as is well known, urged upon local authorities the importance of mitigating the results of any dislocation of industry which might occur in the areas under their control by reason of the war by expediting any scheme of work within its powers.

The board itself has taken special steps to expedite the consideration of applications for their sanction to loans. During the period between August 4th and September 24th it has sanctioned loans desired by local authorities in England and Wales (other than Poor-law authorities) to the extent of over £3,500,000, as compared with about £1,928,000 sanctioned during the corresponding period of the year 1913. The increase thus shown exceeds 80 per cent. Included in the sum mentioned were loans to the extent of £332,000 in respect of the cost of schemes prepared by sixty local authorities for the erection of dwelling-houses for the working classes.

Valuable assistance is also being given by the Road Board to the local authorities of areas in which exceptional distress from want of employment exists. Three large schemes for the construction of new roads, including the new Western Approach Road to London, had been arranged with the local authorities before the outbreak of war. These schemes will be put in hand at an early date. In addition the Road Board have arranged to make grants to an aggregate amount of nearly £450,000 towards works of new road construction and road improvement in many parts of the country, which will involve a total expenditure of about £1,000,000.

Of the staff and employees of the Surrey County Council, thirty men joined the colours before the war and 103 have joined since. The Highways and Bridges Committee have been authorised to spend, if found necessary, £1,000 in road widening or other improvements so as to avoid the necessity of paying of labour employed, but at the moment temporarily discontinued owing to delay in the supply of materials.

Although over 19,000 members of the Automobile Association have volunteered their cars and motor cycles for war services, difficulty is still being experienced in keeping pace with the requirements of the authorities and organisations working in various parts of the country. To facilitate the supply and distribution of cars called for, the secretary will be grateful if members will kindly notify which branch of volunteer work they would prefer to undertake, also the time they have available. Communications should be addressed to the Secretary, A.A. and M.U., Fanum House, Whitcomb-street, Coventry-street, London, W.C.

Instances of the patriotism of private firms multiply daily. The latest is that of Messrs. Robert McAlpine & Sons, public-works contractors. Dr. Douglas McAlpine is with our Army in France, and Captain Robert McAlpine has offered his services. The firm are paying 5s. per week to the wives of their men called to the colours, with 1s. 6d. per week additional for each child. They also offer a bonus of £3 to every man in their employment who joins the Army within four weeks, and will place these men on their return. They will give the same assistance to dependents of those who now join as they offered to the families of those already serving.

America's First Waterworks.—The first waterworks in America are said to have been constructed in 1754 by Hans Christopher Christiansen to supply the Moravian settlement at Bethelehem, Penn. The waterworks included a pump of lignum-vitæ, of 5-in. bore.

Ironite is being used on the following jobs: Mount Vernon Hospital, Northwood; new reservoir for the Metropolitan Water Board at Shooter's-hill, Eltham; Bank of British West Africa, Limited, Liverpool; York Waterworks, Lendal Bridge, York; Stockport Corporation Waterworks; Great Grimsby Waterworks; heating chamber and subway, Lord's Cricket Ground; cattle pens, Bordesley Station, Birmingham; Union Bank of Manchester, York-street, Manchester.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bath £86,000, Deptford £6,500, Folkestone £20,000, housing and town planning—Tynemouth, roads and materials—Dartford, Deptford, Nottingham £8,000, Worcestershire £2,157, sewerage and sewage disposal—Croydon, Marlow-on-Thames, water, gas and electricity—Berwick £70,000, Lewes £5,400. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Bath T.C.—It is proposed to carry out an extension scheme at the bathing establishment, at an estimated cost of £86,000.

Blackpool T.C.—The borough surveyor, Mr. J. S. Brodie, has prepared plans for baths, laundry, and wash-houses on a site at the corner of Central-drive and Bloomfield-road, at an estimated cost of £30,000. The Baths Sub-Committee have, however, postponed the consideration of the project in order that the borough surveyor might prepare a plan and estimate for a smaller bath minus the laundry and wash-houses.

Deptford B.C.—It is proposed to erect public baths and washhouses in the North Ward district, at a cost of £6,500.

Devon C.C.—It has been agreed to reconstruct the bridge on Exeter-Barnstaple road, near Umberleigh Bridge, at an estimated cost of £1,532.

Fleetwood U.D.C.—In connection with the proposed foreshore improvements at Fleetwood the surveyor, Mr. E. Frobisher, has submitted plans showing the levels of the foreshore above high-water mark from the pier to Laidley's-walk, and he has been instructed to prepare estimates of the cost of erecting a concrete wall and of piling.

Folkestone T.C.—A scheme has been approved for the erection of a band pavilion, at an estimated cost of £20,000.

Holmfirth U.D.C.—A scheme for the erection of a generating station has received the sanction of the Local Government Board.

Honiton R.D.C.—The council have decided to inform the county council that they are prepared to combine with other districts in the provision of a temporary small-pox hospital.

Ipswich T.C.—It has been decided to build a small-pox hospital at Foxhall Heath, at an estimated cost of £5,110.

Loughborough R.D.C.—The surveyor, Mr. H. J. Morgan, recently submitted plans for a proposed new bridge at the dangerous corner at the entrance to Wymeswold, providing a wider carriageway, and a footpath, which did not exist on the present bridge. The council decided to forward the scheme to the Road Board with a request for a grant towards the cost.

Newbury T.C.—A new roof is to be constructed on the corn exchange, at an estimated cost of £1,000.

Newmill U.D.C.—Messrs. Marriott, Son & Shaw have been authorised to submit to the Local Government Board the details of the proposed new reservoir scheme.

Tamworth T.C.—A decision has been reached to build a chapel at the cemetery, at an estimated cost of £950.

HOUSING AND TOWN PLANNING.

Ardrossan T.C.—The Local Government Board having inquired what action the town council propose to adopt with respect to the scarcity of houses for the working class, the Public Health Committee have been asked to report on the subject.

Dawlish U.D.C.—The council have agreed in principle that housing accommodation is needed in the district.

Irvine T.C.—Plans have been passed for the erection of ten double cottages in a street to be formed to the south-east of Ballot-road; four blocks of dwelling-houses on the south side of Kirk Vennel, and eight blocks of dwelling-houses on the east side of Ayr-road.

Rochdale T.C.—The corporation are recommended by the Health Committee to build a number of workmen's dwellings.

Shoebury U.D.C.—The surveyor, Mr. E. Read, submitted recently a plan for the proposed workmen's dwellings. He said he had considered the different types of cottages being erected in other districts, and had visited those at Chelmsford. That type of cottage would, he thought, be suitable for the district. He estimated the cost at £200 per cottage, inclusive of fencing. The plan was referred to the Buildings Committee for consideration.

Stoke-on-Trent T.C.—A resolution has been passed instructing the Housing Sub-committee to prepare a scheme for the erection of workmen's dwellings in the borough.

Tynemouth T.C.—A scheme has been adopted for the erection of ninety-five workmen's dwellings.

PARKS AND OPEN SPACES.

Rothesay T.C.—The extension of the municipal golf course is under consideration.

REFUSE COLLECTION AND DISPOSAL.

St. Andrews T.C.—The council have given the Patent Lightning Crusher Company, Limited, 14A Rosebery-avenue, Gray's Inn-road, London, an order for a dust manufacture plant for reducing house refuse to manure.

ROADS AND MATERIALS.

Bracebridge U.D.C.—An appeal has been made to the Road Board and the Local Government Board for a grant towards the cost of the proposed Fountain Corner improvement.

Chesterton R.D.C.—Road improvements on an extensive scale are to be carried out under the direction of the Road Board, which will make a grant of 75 per cent of the cost.

Coventry T.C.—The Works Committee recommend the construction of a new street across Gosford Green, at an estimated cost of £1,900.

Dartford R.D.C.—The question of participating in the cost of constructing a new lower road from Dartford to Erith has been referred to the Highways Committee. At the last meeting Councillor Vinson stated that the proposed road would be 2 miles and 20 yds. long, and its construction would cost £19,232, towards which the Road Board and the Kent County Council would advance £12,482. The Erith and Dartford Urban District Councils were quite prepared to contribute their proportion of the remaining £6,750. The owners were giving the land, and would construct footpaths 8 ft. wide on each side of the road, which would be 40 ft. in width. The county council would take over the road and maintain it when completed. It was their wish that the work should be put in hand as quickly as possible.

Deptford B.C.—The General Purposes Committee have been authorised to carry out the repaving of New Cross-road with wood, and to make application to the Road Board for a loan, free of interest, to meet the cost of the work.—It has been agreed to repair a number of roads at an estimated cost of £6,000.

Enfield U.D.C.—The surveyor, Mr. R. Collins, has received instructions to prepare plans for making up two streets.

Falkirk T.C.—An estimate of £400 has been passed for works of road repair.

Forfarshire C.C.—It has been agreed to reopen Shielhill Quarry in connection with the reconstruction of the Lumley Den-road. The quarry was closed down eighteen years ago when it was found that the stone was not satisfactory. The committee thought, however, that the stone might be given another trial. It was explained that there would be a considerable saving by taking the stone from Shielhill rather than from Craigie Quarry. The cost per ton worked out at 5s. as against 8s. 8d. from Craigie.

Grays U.D.C.—The Road Board have sanctioned a scheme for the improvement of Stifford-road at an estimated cost of £5,800.

Inverness-shire C.C.—Schemes are under consideration for the improvement of Loch Ness-side, Beauly and Glenelg roads at an estimated cost of £4,500.

Linlithgowshire C.C.—The road surveyor to the Bathgate District Committee, Mr. T. Y. Ramsay, reports that, further, large grants have been received from the Road Board in aid of the improvement of the surfaces on the Blackburn and on the Bathgate-Airdrie road.

Manchester T.C.—The plans for the new road which is proposed to be made from Sale-lane to Cheadle have been approved by the Improvements Committee, and the work will now be proceeded with as early as possible. The Road Board has already sanctioned the scheme, and the local plans have been submitted to that body. The road when completed will be one of the finest in the district. It will be 5 miles long and 80 ft. wide, including footpaths 15½ ft. wide. In the centre of the road will be a long stretch of greensward, which may in the future be converted into a tramway, while between the roadway and the asphalted footpath there will be a gravel path along which trees will be planted. The estimated cost of the proposed road is £198,728, towards which the Road Board has made a grant of £60,000.

Middlesbrough T.C.—The borough surveyor, Mr. S. E. Burgess, has prepared plans for widening Marton-road and Acklam-road, at an estimated cost of £30,000.

Nottingham T.C.—The question is being considered of carrying out various repairs to footpaths and carriageways at an estimated cost of £8,000.

Romford R.D.C.—Alternative schemes for the widening of Station-road, which have been prepared by the surveyor, Mr. G. Lapwood, have been forwarded to the county council.

Romford U.D.C. It has been agreed to proceed with private street works in the parish of Dagenham, at an estimated cost of £2,095.

St. Austell R.D.C.—Conditional upon the owners contributing half of the cost, it has been agreed to construct a new road on the Poltair estate, at an estimated cost of £603.

Sunbury U.D.C.—The council have accepted the tender of Messrs. Langley & Johnson, of Slough, at £12,089, for road widening work at Charlton, subject to the approval of the Metropolitan Water Board. The surveyor (Mr. H. F. Coales) stated that the firm had given him an assurance that they would be prepared to carry out the work with local labour, as far as possible, after appointing their own foreman and a few of the principal men.

Worcestershire C.C.—As a result of an interview which the county surveyor, Mr. C. F. Gettings, had with them on the subject of special additional road improvement works, the Road Board have intimated that they would be prepared provisionally to approve the proposals submitted for suggested work to be carried out in case it should be necessary, in view of the state of employment, to initiate additional road improvement works in the county. The estimated cost of the suggested work is £29,457, and the terms are stated to be far more favourable than those usually granted.

SEWERAGE AND SEWAGE DISPOSAL.

Aberdeen T.C.—Sewer extensions are to be carried out at a cost of £125.

Ashton-under-Lyne T.C.—The tender of Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, has been recommended for acceptance for two of their patent "Simplex" rectangular travelling distributors.

Bath R.D.C.—The Local Government Board have approved the plans of the Freshford sewage disposal scheme as generally satisfactory, but suggest various minor amendments, which will be duly carried out.

Brighouse T.C.—The tender of Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, has been accepted for their well-known "Simplex" rotary sprinklers.

Croydon R.D.C.—The advice of an expert is to be obtained on the scheme for the proposed reconstruction of the sewage works prepared by the surveyor, Mr. R. M. Chart.

Disley R.D.C.—The amended plans of the Newtown sewerage scheme, as suggested by the Local Government Board, have been passed, and application is to be made for authority to borrow £302 to cover the cost.

Mansfield T.C.—The council are giving consideration to a report by Mr. J. D. Watson on certain suggested improvements at the sewage disposal works.

Oswestry R.D.C.—The council have instructed Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, to prepare a scheme of sewerage for St. Martins.

Romford U.D.C.—Sewerage works estimated to cost £470 are to be carried out in the parish of Dagenham.

Rotherham T.C.—A further repeat order has been placed for patent "Simplex" rotary sprinklers with Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham.

Sedgefield R.D.C.—The surveyor, Mr. J. Stones, has submitted alternative schemes for the extension of the sewage works, one consisting of the addition of 2 acres of land, and the other of filter-beds. The matter has been sent to the local committee.

Tendring R.D.C.—The council have instructed Messrs. Taylor & Wallin, civil engineers, of Newcastle-on-Tyne and London, to report upon the drainage of the parish of Thorpe-le-Soken.

Wolverhampton T.C.—It has been resolved to instal electrical plant at the sewage disposal works at an estimated cost of £730.

WATER, GAS, AND ELECTRICITY.

Anstruther T.C.—Under pressure from the Local Government Board, who wrote that they could not permit the question of the removal of the sources of pollution of the water supply to be indefinitely delayed, the council have agreed to hold a conference with the Pittenweem Town Council, with a view to settling the water supply problem.

Berwick T.C.—When the trials at the new borehole in Tweedmouth yielded such unsatisfactory results, it was decided to call in the services of outside engineers, with a view to finding an augmentation of the present water supply. Messrs. Leslie & Reid, Edinburgh, to whom the commission was given, have now presented their report, which has been printed and circulated among the members of the committee. The schemes proposed by the engineers are all gravitation supplies. One is to bring the water from one of the burns in the Wooler district; and the one which is most favoured by the engineers is to bring the water by gravitation from the Lammermoor district, a distance of about 26 miles. This, it is estimated, will cost something like £70,000.

Chertsey R.D.C.—The tender of Messrs. Hardy & Co., of Woking, at £1,780, has been accepted for the surface-water scheme for Byfleet Village.

Chippenham T.C.—A filtration system for the improvement of the water supply is to be provided at a cost of £1,500.

Cowes U.D.C.—The pumping machinery at the waterworks is to be duplicated, and a new main laid, at an estimated cost of £5,000.

Dungannon U.D.C.—The council have sanctioned an application by the Joint Committee of the urban and rural district councils for a Provisional Order for the acquisition of a number of springs in the water catchment area at Altmore. The council's engineer estimated the cost of the scheme at £2,000.

Hampton U.D.C.—The council having entered into a contract with the Hampton Court Gas Company for the automatic lighting of the public street lamps in East and West Molesey, a commencement of the installation was made on Friday. There are upwards of 200 lamps in the district, and the system to be adopted is the "Gunfire," the clockwork arrangement of which will be set weekly according to a time schedule.

Ipswich T.C.—The work of laying the Shotley water main for the purpose of supplying the Naval Barracks with Ipswich water has been completed by the contractor, Mr. J. Moran, well under the contract time. The pipes covered a distance of 10 miles. The undertaking was carried out under the supervision of the Ipswich waterworks engineer, Mr. C. W. S. Oldham.

Larne R.D.C.—It has been decided to proceed with a water supply scheme for the parish of Woodburn.

Newton Abbot U.D.C.—Ilsington and Liverton are

to be provided with water supplies, at an estimated cost of £3,208, the works including the construction of a reservoir.

Norman Cross R.D.C.—The Local Government Board having written advising the council to obtain a water supply for Orton Waterville from the Peterborough water mains, the council discussed the subject, and eventually instructed the surveyor, Mr. H. Hawkins, to invite tenders for boring still further an existing well, in which there is stated to be always plenty of water.

Plymouth T.C.—The report of the water undertaking for 1913-14 shows a nett profit of £8,351, an increase of £948 upon the preceding year.

Stoke-on-Trent T.C.—The total revenue from the electricity undertaking was reported to be £52,560, and the gross profit £16,629, but after paying sinking fund charges there was a nett loss of £5,139, to which was added £1,023 on account of capital expenditure paid out of revenue. The loss was chiefly accounted for by extraordinary repairs to plant, increase in rate assessment, and the higher cost of fuel.

Wem R.D.C.—Instructions have been given for the preparation of a report upon a water supply scheme for Prees.

MISCELLANEOUS.

Hull T.C.—Mr. Christopher Pickering, of Hornsea, has given 11½ acres of land at Pickering Park for the purpose of a boating lake. His object is to provide work for the unemployed, and it is estimated that in the construction of the lake 93 per cent of the wages will be expended upon unemployed workmen, and the greater part of the remaining 7 per cent will be distributed among the workmen affected by the war. The minimum value of the land is £300 per acre. The scheme, towards which the Local Government Board will contribute £3,000, will give employment to 200 men for seven months.

Stepney B.C.—In reference to the London County Council's proposal to reconstruct the trackwork of the old horse tramway in Burdett-road and Grove-road, the Works Committee report that there is reason to apprehend that the London County Council have in view the installation of the overhead system of traction. The borough council having held that the only system suitable for the roads in question is the underground conduit system, the committee will recommend that a communication be addressed to the London County Council in opposition to the suggested reconstruction under the circumstances.

Stoke-on-Trent T.C.—It has been decided to proceed with public works to the amount of £45,000 to relieve unemployment in the six Potteries towns. Of this amount £12,000 will be spent in labour alone.

PERSONAL.

Mr. David Edwards, of Burry Port, has been appointed borough surveyor and inspector of Kidwelly.

Mr. J. Dunn, assistant surveyor to the Alfreton Urban District Council, has been appointed assistant surveyor to the Maidenhead Town Council.

Mr. W. Langford, engineer at the Longton gasworks, has been appointed chief engineer and manager of the gas undertakings of the Corporation of Stoke-on-Trent, at a salary of £600 rising to £700.

Mr. Frank J. Harris, surveyor to the Holsworthy Rural District Council, has been appointed assistant surveyor to the Devon County Council, under Mr. R. M. Stone, county surveyor for No. 1 Division, at a salary of £150, rising to £200, and an allowance of £40 per annum for a motor cycle.

Mr. F. A. Furber, surveyor to the Quarry Bank (Staffs) Urban District Council, has for many years been a lecturer in sanitary science at the Birmingham Technical Institute. As a result of his teaching last year the whole of his pupils succeeded in passing the examination, and 85 per cent of them first-class. Mr. Furber has been offered and has accepted two additional certificates.

Mr. Herbert Chatley, M.INST.C.E.I., Professor of Civil Engineering at the Chinese Government Engineering College, North China, formerly of the borough engineer's department, Fulham, and of the Municipal Technical College, Portsmouth, has received the degree of Doctor of Science (Engineering) from the University of London. His thesis deals with the subjects of convex contact and rolling resistance, and will probably be published in the *Journal* of the Institution of Municipal and County Engineers. Numerous papers and books on engineering subjects which he has published were presented in support of his candidature.

Mr. Charles H. Waithman, the engineer and surveyor to the Cleethorpes Urban District Council, a portrait of whom is given on another page of this issue, was educated at Cranleigh and Hutton Grammar School. He received his training in the offices of the Teignmouth Urban District Council, and has since held appointments under the urban councils of Kingswood (Bristol), Lynton, Leighton Buzzard, and Newmarket. During the period covered by these appointments he has designed and carried out many important improvement schemes. Noteworthy among these was a main road steel girder bridge and road widening, and the reconstruction of the sewerage outfall works at Leighton Buzzard; also the reconstruction of the sewerage outfall works, and a new technical school at Newmarket, for which latter work he was architect. Mr. Waithman has taken a particular interest in the modern methods of road making, and has carried out many miles of reconstruction work on various systems, including a resurfacing scheme at Newmarket, for which a loan of £5,000 was granted. He is the patentee of the "Waithman" reservoir tar broom, which is used so extensively by county and municipal authorities, both throughout this country and abroad. In addition to the municipal works mentioned in his paper at the recent meeting of the Institution of Municipal and County Engineers at Cleethorpes, he is now engaged upon a scheme for the reconstruction of a marine lake, open-air bathing place, and promenade extension. He is an associate member of the Institution of Civil Engineers, and holds the diploma and is a member of the Municipal and County Engineers. He also holds the diploma of the Royal Sanitary Institute.

SOME RECENT PUBLICATIONS.*

The Public Health Acts, annotated, with appendices containing the various incorporated Statutes and Orders of the Local Government Board, &c. First Edition, Public Health Act, 1875, by W. G. Lumley, LL.M., Q.C., Counsel to the Local Government Board, and Edmund Lumley, B.A., of the Middle Temple, Barrister-at-Law. Eighth Edition. In two volumes. By Alexander Macmorran, M.A., one of His Majesty's Counsel, and Joshua Scholefield, of the Middle Temple and North-Eastern Circuit, Barrister-at-Law, assisted by Gerard R. Hill, M.A., of the Inner Temple and North-Eastern Circuit, Barrister-at-Law, and Kenneth M. Macmorran, M.A., LL.B., of the Middle Temple and Western Circuit, Barrister-at-Law. Price £3 15s. net. London: Butterworth & Co., and Shaw & Sons.

It is six years since the last edition of this valuable standard work was published. During that period some twenty Acts of Parliament relating wholly or partially to matters within the scope of the work have been passed. To mention only one or two of the more important, there are the Housing and Town Planning Act, 1909, the Development and Roads Improvement Funds Act, 1910, the National Insurance Act, 1911, and the Shops Act, 1912. Moreover, some of these Acts delegate what are practically legislative powers to Government Departments; so that, as camp followers trail behind an army, a horde of rules, regulations, orders and departmental circulars have followed in the wake of these statutes. And, again, as probably no Act of Parliament ever was, or ever will be, passed without sooner or later presenting conundrums and enigmas for the solution of His Majesty's judges, not a year passes without its crop of judicial decisions on points of public health and local government law, amounting on an average (according to the learned editors of these volumes) to not far short of 100 per annum. It is not surprising, therefore, to learn from the preface that the most difficult problem which the editors had to face in preparing the present edition was that of space. The last edition extended to two decidedly bulky volumes, and how was so much new matter to be

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

[illegible] By a [illegible] combination of [illegible] and [illegible] has been achieved. Provisions [illegible] to Scotland and Ireland [illegible] in consolidating existing [illegible] and a few explanatory [illegible] have been [illegible]. Acts of Parliament are referred to in the text by their short titles only (the regnal years and chapters being given in the Table of Statutes), and references to cases are restricted to two sets of reports (other references appearing in the Table of Cases).

By the use of these expedients the two new volumes bulk little more than their predecessors, notwithstanding the very considerable enlargement of their contents. Special attention has been devoted to the housing and town planning provisions, which have been so to the fore since the passing of the Act of 1909, and to the revision of the notes dealing with the powers of the Local Government Board by no means one of the least useful features of the work to the practical official. The case law has been brought right up to date, and includes the recent very important decision of the House of Lords, under the [illegible] Act, in *Local Government Board v. Arlidge*. The new edition, in short, fully maintains the high reputation of those which have preceded it, as a thoroughly reliable and self-contained text-book on all that is included in the comprehensive expression "The Law of Public Health," and the powers and duties of district councils.

FOR OTHER ADVERTISEMENTS

See End of Paper.

EASTERN VALLEYS (MONMOUTHSHIRE) JOINT SEWERAGE BOARD.

APPOINTMENT OF ENGINEER.

The above-mentioned Board invite applications for the position of Engineer to the Board, to advise the Board as to the preparation of a Sewerage Scheme, &c.

Applications, stating qualifications and terms required, to be sent to me on or before the 9th prox.

W. H. V. BYTHWAY,
Clerk to the Board.

Pontypool.
September 30, 1914. (1,972)

HOLSWORTHY RURAL DISTRICT COUNCIL.

APPOINTMENT OF SURVEYOR OF HIGHWAYS.

The above Rural District Council are prepared to receive applications for the appointment of Surveyor of Highways.

The district comprises 21 parishes with about 40 miles of main roads and 233 miles of district roads.

The salary will be £130 per annum, rising by annual increments of £5, on satisfactory service, to a maximum of £150, to include all out-of-pocket expenses except stationery and postages.

The person appointed must have a good practical knowledge of road making, and be competent to properly supervise the working of the steam roller and the roadmen in the Council's employ.

He will be required to devote the whole of his time to the duties of the office, to keep the necessary books and accounts applicable thereto, reside at such place as shall be approved by the Council, and to provide his own means of locomotion.

Approved security in the sum of £100 will be required, and the appointment will be subject to the approval of the County Councils of Devon and Cornwall, and be terminable by three months' notice on either side.

Applications, in candidate's own handwriting, stating age (which must be between 25 and 45 years) and present and previous occupations, accompanied by copies of not more than three testimonials of recent date, to be sent to me on or before Tuesday, the 13th day of October next, endorsed "Surveyor of Highways."

Canvassing the Councillors is strictly prohibited, and will be deemed a disqualification.

(By order)
CLAUDE KINSMAN,
Clerk to the Council.

8 North-road,
Holsworthy.
September 30, 1914. (1,971)

CITY AND COUNTY OF THE CITY OF EXETER.

ARCHITECTURAL ASSISTANT.

Required, in the City Surveyor's Office, a temporary Architectural Assistant.

Candidates must be experienced in the preparation of Contract Drawings and Quantities.

Salary, £2 2s. per week.

Applications, stating age, experience, past and present employment, and accompanied by copies of not more than three testimonials, to be sent to me not later than 13th October, 1914, endorsed "Architectural Assistant."

THOS. MOULDING, M.INST.C.E.,
City Engineer and Surveyor.

Municipal Offices,
Exeter.
September 29, 1914. (1,973)

SECOND CLASS OVERSEER required for the Public Works Department, Hong Kong, for three years, with possible extension. Age 23-30; unmarried. Salary £200, rising by £10 every two years to £230. Free unfurnished quarters and passages. Candidates should be experienced in construction and maintenance of macadamised roads, tar-macadamised roads, tar-painted roads, compressed asphalted roads, and paved footways, and in working a stone quarry with stone-crushing plant, capable of measuring up and preparing statements of work done. Candidates with the above experience should apply at once, by letter, to the Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W. (1,977)

BOROUGH OF HAMMERSMITH.

TO PAVING CONTRACTORS AND OTHERS.

The Council invites Tenders for Paving the Carriageway of Dalling-road (between Paddenswick-road and Brackenbury-road; approximate area, 5,200 super. yds.) with 4½-in. Creosoted Deal Blocks upon 8-in. Concrete Foundations, in accordance with Specifications which, with Forms of Tender, may be obtained on application to Mr. H. Mair, M.INST.C.E., Borough Surveyor.

Sealed Tenders, endorsed "Tender for Wood Paving Works, Dalling-road," must be delivered to me not later than 4 p.m. on Wednesday, the 14th October, 1914.

The Council does not bind itself to accept the lowest or any Tender.

LESLIE GORDON,
Town Clerk.

Town Hall, Hammersmith, W.
September 29, 1914. (1,976)

BOROUGH OF KINGSTON-UPON-THAMES.

The Corporation invite Tenders, not later than the 14th October, 1914, for about 6,000 yds. of Press Cloth for their Sewage Works, according to the Specification to be obtained of the Borough Surveyor.

HAROLD A. WINSER,
Town Clerk.

Municipal Offices,
Kingston-upon-Thames.
September 29, 1914. (1,975)

BOROUGH OF KINGSTON-UPON-THAMES.

SULPHURIC ACID.

The Corporation invite Tenders for the supply, during the ensuing twelve months of about 300 tons of 80 per cent Sulphuric Acid for their Sewage Works.

Further particulars and Forms of Tender may be obtained of the Borough Surveyor, Mr. R. Hampton Clucas, at the Municipal Offices.

Sealed Tenders, endorsed "Sulphuric Acid," to be delivered at this office not later than Wednesday, the 14th October, 1914.

The lowest or any Tender will not necessarily be accepted.

HAROLD A. WINSER,
Town Clerk.

Municipal Offices,
Kingston-upon-Thames.
September 29, 1914. (1,974)

ACTIVE AND CAPABLE CITY GENTLEMAN, having had to give up business owing to the war, is anxious to find employment in any capacity which may enable him to support his wife and family. References, the Editor of THE SURVEYOR. —BOX 1,472 office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,970)

Institution of Municipal and County Engineers.

THE CLEETHORPES MEETING.

(Conclusion.)

[illegible] Cleethorpes. [illegible] given herewith.

Mr. A. E. Collins [illegible] said he did not know [illegible] the proposed modifications at the [illegible] in Cleethorpes. A discussion had taken place as to what the height of rooms should be. They were [illegible] at the

Alderman Wm. Grant, J.P., C.C.,
Chairman, Cleethorpes Urban District Council.

[illegible] press, and it had been suggested that the [illegible] in Cleethorpes [illegible] too great a height. It was [illegible] necessary, so far as health was concerned, to have [illegible] greater height than 7 ft. if proper means of ventilation were provided. The difference of cost between rooms of 7 ft. and 9 ft. in height was pretty considerable. As to sanpcourses, these were, of course, essential, but the question was, what materials should be allowed. Builders put in felt and so-called bituminous materials, but tests would show that they were quite useless for the purpose they were intended to serve. It was a question to be settled as to what should be allowed. At present they had to bind a man before a magistrate in order to prevent the use of what they considered to be objectionable materials. Then as to the matter of by-laws for different classes of buildings, there were, doubtless, in Cleethorpes certain areas where they would like to allow a cheap class of building, for instance, where it was far enough from the sea for the land not to be of great value. He thought they should be in a position to permit the erection of a cheaper class of building in certain situations, and that the by-laws should be governed by the amount of open spaces round the buildings. As to rounded corners, he quite agreed as to the rounding of boundary fences, but disagreed as regarded the kerbs. Kerbs kept out to the ordinary radius prevented reckless driving, and he thought they ought to be very careful indeed in rounding-off corners to large radii at the kerb lines. Mr. Alford, in speaking of the motive power adopted for the pumping of sewage, had said that, for reasons which would probably not be questioned, it was considered town's gas engines were the best to adopt; but perhaps he would say why he had so chosen. It would be interesting to know the governing consideration in that connection, and, perhaps, in dealing with the point, he would tell them the average dry-weather flow and the maximum for storm water. Mr. Alford gave what he considered the proper times for the discharge of the sewage; that was not in accordance with the usual practice, and he would like to know what were the special conditions in the mouth of the Humber which made it advisable there. He fancied Mr. Whyatt had not grasped Mr. Alford's meaning as to the matter of tendering. It was a very awkward position to be put in to be obliged to accept the lowest tender, and that, he understood, was Mr. Alford's complaint.

Mr. E. J. Silcock (Westminster and Leeds) said he quite agreed with the remark made by Mr. Whyatt that it was not quite in good taste to refer to the Grimsby sewage outfall. He had had occasion to examine this professionally, and knew something about it, and he did not think it was a remark quite called for. He was very pleased indeed to see that the county council were wise enough to have a scheme prepared by so competent a man as Mr. Alford, and that they had carried out this scheme on the best lines for the town. He knew something of the scheme

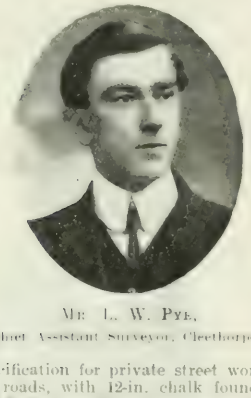
Mr. Chas. H. Waltham, Assoc.M.Inst.C.E.,
Engineer and Surveyor, Cleethorpes.

which was previously considered, and there were grave defects in that scheme which would have made themselves felt as the town grew in importance. It might have done for the time being, but as the town grew it would have become apparent. Mr. Alford had adopted a combination of machinery which appeared to be a very good one—reciprocating pumps for the dry-weather flow and centrifugal pumps for storm water. One of the difficulties was to provide elasticity in the pumping arrangements for the difference in the volume of sewage to be dealt with. He did refer to this matter indirectly in the meeting at Cheltenham, and he was rather criticised for saying that the pumping machinery ought all to be duplicated. He noticed here that Mr. Alford had got duplicates, but it only provided for the dry-weather flow. He had got three storm-water units; they were not working constantly or very often, and consequently if one got out of order there was more chance of putting it right again than with the ordinary flow. With regard to the tank, the cost of massed concrete worked out at more than the reinforced concrete. His experience was that for covered tanks the cost of massed concrete and reinforced concrete was, approximately, the same. There was not very much saving to be effected by the adoption of reinforced concrete. He appreciated that the foundations were bad, and the total amount of weight might have had an important bearing on the decision as to the size and strength of the

"The Municipal Works of Cleethorpes," by Mr. C. H. Waltham, Assoc.M.Inst.C.E., the engineer and surveyor, and "The Cleethorpes New Sewerage Scheme and Outfall Works," by Mr. John S. Alford, M.Inst.C.E.

[illegible] That might have caused the excessive [illegible] to be the case [illegible] but with the exception of some of the [illegible] of the excessive [illegible] that [illegible] the [illegible] and the [illegible] good. The Chairman of the [illegible] committee had [illegible] to be rather a [illegible] that [illegible] the [illegible] would be [illegible] to be [illegible] and the [illegible] would [illegible] a [illegible] [illegible] [illegible] would like to see if the [illegible] [illegible] He was [illegible] [illegible] should not be.

Mr. F. Waghorn said [illegible] to associate himself with the vote of thanks to the authors of the papers. He would like to ask Mr. Waithman whether the site of the destructor was the most suitable that could be obtained. The destructor appeared to be [illegible] to the borough. Had the position been decided from a desire to have the destructor close to the [illegible] [illegible] With respect



Mr. L. W. Pye,
Chief Assistant Surveyor, Cleethorpes.

to the specification for private street works of 36-ft. and 40-ft. roads, with 12-in. chalk foundation, and 30-ft. and 12-ft. back roads, with 8-in. chalk foundation, did Mr. Waithman consider chalk a suitable material for the foundation of roads? He was pleased, in going about Cleethorpes, that the authorities had rounded the corners of the roads; it was a very great advantage, and as a cyclist he appreciated it very much. In coming to Mr. Alford's paper, he noticed that gentleman acknowledged the very great assistance he had received from Mr. Pye, the assistant surveyor, a gentleman who had done such good work for Cleethorpes. Mr. Alford mentioned that some parts of the northern intercepting sewer were built on piled foundations. Could Mr. Alford give them the breath of the sewer so constructed? Reference had already been made to the Grimsby sewage outfall. He admitted that the Grimsby sewage outfall was not all that could be desired, but seeing that there was to be an improvement in that outfall, he did not see why he should make reference to another authority. He should like to suggest that this portion be deleted, as incidentally it could not do Cleethorpes any good.

Mr. T. P. Frank (Newark) inquired whether any compensation was given in cases where the corners of streets were rounded off. As they had old by-laws in force in the town he represented they had no provision for requiring that to be done, but had to compensate the owners where such work was carried out. The principle they had adopted was that the kerbs should be left to a small radius, and that the building lines should be set back. The nature of the subsoil and the costly nature of some of the sewerage work had been mentioned. Could Mr. Alford state the costs of the different sizes of mains?

Mr. A. Hellawell (Withington) stated that in Manchester they had a provision for 9-ft. back roads between boundary walls. As to temporary buildings, those were licensed for two years, and when they were required to be removed three months' notice was given. The reason for that was that it might happen that a photographer who was allowed to erect a studio at the back of his premises might fail in business and be followed by a greengrocer who, by accumulating boxes and so forth in the structure, might encourage vermin. Therefore, on such changes of tenancy, they gave notice for the building to be cleared away.

Mr. J. Thropp (Lindsey, Lincs) remarked that the cost of tar-macadam (2s. 8d. per yard super) seemed rather high, and he would be glad to know how the [illegible] had arrived at. He saw there was a gradual reduction in the cost of maintenance for, whereas in 1911 the figure was £162 7s. in 1913 it was £112 3s. per mile. That was very gratifying if the quality of the roads was not suffering. Clearly, work was rather different from municipal work, and with regard to rounding corners they had no streets particularly to deal with; but if they did not have these rounded corners at too great a radius it was very desirable.

The President (Mr. L. S. Pickering) [illegible] two remarks he would like to make. The first was to congratulate the town upon their decision to carry out a town planning scheme. That had not been referred to in the discussion. It was a very important matter. The only thing that struck him was the very large area they proposed to town plan, 10,000 acres, whereas the area of their town town was only 1,184 acres. The scheme was too ambitious to be granted by the Local Government Board. Although a town wanted to include as large an area of their own as possible, it seemed that the Cleethorpes people were anxious to include the whole of Grimsby in their scheme. Mr. Waithman rather regretted the decision of the Local Government Board in their requirement of separate units for the destructor. He was rather inclined to think, after three or four years' experience of working, he would alter his mind. It was very desirable that there should be separate units. Although the cost would be greater it was desirable. It was impossible to use one unit efficiently owing to stoppages for necessary repairs. With regard to the use of the steam for concrete and work, and for the purpose of tar-macadam, he thought probably from the quantity of refuse to be destroyed it would be found there was a great amount of steam running to waste. He did not know whether Mr. Waithman had thought of the quantity he would require. With respect to Mr. Alford's paper, the first question was as to the admission of rainfall to the sewers. Mr. Alford had calculated on ⅝ in. per hour finding its way to the sewers. That appeared a very low estimate indeed. He presumed occasionally in Cleethorpes there had been known storms of a rainfall of 2 in. per hour. In cases like that, and even with one half of that falling, and with the modern practice of having impervious surfaces, he thought the water finding its way to the sewers must be considerably more than Mr. Alford was allowing for. He was certainly allowing a great margin in the size of the sewers for an increase in population, and that was a set-off against the small provision for storm water. He should like to ask whether it was based on an actual test in Cleethorpes or in some other town. It was an important matter in Cleethorpes, owing to there being no storm overflows, and every gallon having to be pumped. He certainly agreed with Mr. Spicock as to massed and reinforced concrete. His experience was that the reinforced concrete worked out at the less cost. In this case the tank had cost £13,750, whereas it might have been built for £10,000. That would have been a saving of £3,750. The reply would be that with the longer period of loan the annual charge was less on the outlay. That was not the way an ordinary business man would look at it. Taking it that the ferro-concrete design was sound, it was not good business to adopt the massed concrete design, even though the period of the loan was longer. He would like to know the number of ventilators he proposed to erect, and also as to the consumption of gas. Perhaps Mr. Alford would give them a little more information as to how this ventilation was to be carried out. He thought they all agreed with the concluding paragraph as to the divergence in the periods granted for loans between the Parliamentary Committees of the House of Commons and the Local Government Board. It was advisable that there should be some co-ordination between them; whether they went to Parliament or to the Local Government Board, the same time should be allowed for the repayment of the loan. They would also agree as to the undesirability of always accepting the lowest tender; and he would go further and say the undesirability of having to advertise for tenders for certain work, particularly for pumping machinery. Unfortunately there was not that power locally, but he thought, in the great majority of cases, local authorities carried it out in practice, disregarding the Act, and depending upon the good sense of the auditor to approve their action.

Mr. Waithman, in replying, explained that the cheapness of the tar-painting was to a great extent due to the fact that the council had done the work

for some years past, and the surfaces of the roads were such that a large quantity of tar was not required. The tar was not distilled, but it was of very excellent quality. Scavenging was, of course, augmented in the season, but not to the extent one might think, their method is being consistently good throughout the year. They had various places for tipping the handcarts, and they sent round each day and collected the material. As regarded the dampness, there was not only the quality but the position of the course to be considered, in some cases they had to see how that it was useless. The matter of temporary buildings was one that engaged the attention of the council for a considerable time, and he was sure all the members would admit that that class of building was a very great eyesore, and one that in time became a nuisance. Their practice was to license them at a charge of 1s. per annum. They were placed under temporary agreements, all falling due on June 30th, and being renewable each year. As to the room in the roof, he thought Mr. Collins had a tendency to lean somewhat towards the builder, and he could not agree with him. The Model By-laws which were enforced under the Act of 1875 gave one that distinction as to the height of the attic room in the roof. He could say without hesitation that the conveniences paid very well; last year the proceeds were just over £230. The electricity undertaking in the North Ward had not yet been able to show a profit. The price of 2s. 8d. per yard super. for tar-macadam was in reference to a particular street carried out in dry granite with bituminous binder, and afterwards painted. The cost was a little more, but there was some difficulty in obtaining delivery of material. Their usual work was 4 in. of tar-macadam. They paid 14s. 5d. and 15s. 4d., and, including subsequent tar-painting, they could not do it much cheaper. In regard to the specification for private street works, they had had no occasion to go before the magistrates. As to the corners, he was entirely in accord with his council on the point. With reference to compensation, in many cases they had the land given, but in other cases they purchased at the rate of the ground rent at 3d. per yard for thirty years. The site of the destructor was put forward some two years ago by himself, and no objection was raised to it, although the Local Government Board inspector, Mr. Hooper, referred to its close proximity to dwelling-houses. The inquiry, however, resulted in a considerable increase of the height of the shaft.

Mr. Alford, in reply, said he was particularly glad to hear Mr. Whyatt say that he agreed with him as to the times of discharge. Mr. Whyatt knew the foreshore, and his opinion was valuable. In arriving at the time of discharge they did it after considerable experiment. Regarding the criticism of the statement in his paper that "the Grimsby sewage outfall, which is near high-water mark, is a source of pollution to the shores of both Grimsby and Cleethorpes," he should not have thought there was any doubt about it at all. It was a plain statement of fact of which he knew to his own knowledge. The Grimsby outfalls discharged at a point where they polluted the foreshore of both towns. The Cleethorpes outfall discharged lower down, and no doubt some of the matter went on the Grimsby shore. But the plain fact was this: that both authorities were polluting the other's foreshore. Cleethorpes had put their house in order, and they were hoping that Grimsby would put theirs in order too. He need hardly remind engineers that any money which Cleethorpes spent to purify its sewage would not be effective of its full value until the complementary part was done at Grimsby, and they felt that Grimsby would show, when this new dock was constructed and the outfall was removed, that that source of pollution was also removed. Mr. Collins asked him to say what decided them in the choice of power for the pumping station. They took town gas because it was cheap, and secondly because the stand-by power was always ready. They had a cheap town gas in Cleethorpes, and it was a power they could call upon at any time when they wanted it. That was the guiding principle. He was afraid he could not say more than this: they did not know what the dry-weather flow was going to be. The dry-weather flow was expected to be 30 gallons per head, while the pumping power was 400 gallons per head per day. With regard to the discharge of sewage, he could not say that he disagreed with what had been said as to that, but criticised the suggestion that had been made that a certain thing was usual in discharging into the sea. Every case required special investigation. Mr. Silcock had spoken as to the flexibility of the plant, and he agreed as to the necessity of that. As to whether the filtration of air was effective, the air filter for the tank it was proposed to put down was largely based on the work at Hampton, where the whole of the air was passed out through an air filter. He could not say what length of sewer was laid on piles. As to Mr. Pickering's remarks upon the subject of rainfall, he did not attach much importance to the stereotyped methods of calculating the volume of storm water; he preferred to go to the town and study the conditions before deciding.

An Appointment Wanted.—We have heard, with regret, of an exceedingly hard case arising out of the war crisis. A gentleman had, after some years of unremitting industry, built up in London a business which provided his sole income. It depended on Continental connection, and the war has put an instant and effective end to it. We appeal to our readers for assistance in the form of work. Anything that would enable him to support his wife and family would be welcomed. He is in the prime of life, active and industrious, a linguist, an excellent correspondent, and a capable organiser. We can testify personally to his high character and general culture.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. Pickering, M.Inst.C.E., Borough Surveyor and Water Engineer, Cheltenham.

HINCKLEY MEETING.

An East Midland District meeting is to be held at the council offices, Hinckley, to-morrow (Saturday).

Programme.

10.45 a.m.—The district committee to meet at the council offices, Hinckley, to discuss general district business.

11.15 a.m.—The members and visitors will be received by the chairman (Mr. G. Kinton, J.P.), and members of the Hinckley Urban District Council.

11.30 a.m.—Discussions on the following papers: "Eleven Years' Municipal Work at Hinckley," by Mr. E. H. Crump, Assoc.M.Inst.C.E., F.S.I., engineer and surveyor to the Hinckley Urban District Council; and "By-laws and the Housing Question," by Mr. W. H. Court, Assoc.M.Inst.C.E., borough engineer's department, Leicester.

12.45 p.m.—Inspection of the public baths adjoining the council offices.

1 p.m.—Luncheon at the Union Hotel, at the kind invitation of the chairman and members of the Hinckley Urban District Council.

2.15 p.m.—Proceed in motor conveyances (at a charge of 3s. per person) to inspect the workmen's dwellings erected and in course of erection in Rugby-road, &c., and thence to the Snarestone Waterworks, 14 miles distant, to inspect the pumping station, &c., where tea will be provided by Mr. E. H. Crump.

4.15 p.m.—Leave Snarestone and drive to Gopsall Park, where members will be given the opportunity of inspecting the gardens, by kind permission of Earl Howe.

6 p.m.—Arrive at Hinckley Railway Station.

E. H. Crump, A.M.I.C.E., *Hon. District Secretary.* Hinckley.

E. G. Mawbey, M.Inst.C.E., *District Chairman.* Leicester.

J. W. Dudley Robinson, B.Sc.(Lond.), *Secretary.*

92 Victoria-street, Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

B. Wyand, *Secretary.*

39 Victoria-street, S.W.

ROYAL SANITARY INSTITUTE.

YORK MEETING.

On Saturday, October 24th, at a meeting of the Royal Sanitary Institute at York, Mr. F. W. Spurr, the city engineer, will read a paper on "The Municipal Treatment of the York Sewage."

In the afternoon visits will be made to the pumping station at Fulford, the sewage works at Naburn, and the new Diphtheria Hospital.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon* on Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—October 3rd.—Corporation of Bootle. £80—£120.—Dr. John E. Gould, medical officer of health.

INSPECTOR OF NUISANCES.—October 5th.—Leake Rural Rural District Council. £60 per annum.—Mr. A. W. Lancaster, clerk, Union Offices, Leake, Yorks.

BURGH SURVEYOR.—October 5th.—Rutherglen Town Council. £220—£300 per annum.—Mr. G. Gray, town clerk.

ARCHITECT.—October 5th.—Aberdare Education Committee.—Mr. T. Botting, director of education, Education Offices.

RESIDENT ENGINEER.—October 8th.—Fareham Rural District Council. 3½ guineas per week.—Mr. Alfred Laker, clerk, 97 West-street, Fareham, Hants.

SANITARY INSPECTOR.—October 10th.—Fulham Borough Council. £120 per annum.—Mr. J. P. Shuter, town clerk.

ASSISTANT SURVEYOR (Temporary).—October 10th.—Harrow-on-the-Hill Urban District Council. £2 per week.—Mr. John Strachan, clerk.

TOWN FOREMAN.—October 10th.—Willenhall Urban District Council. 35s. per week.—Mr. T. Edgar Fellows, engineer and surveyor, Town Hall.

ENGINEER AND SURVEYOR.—October 13th.—Portland Urban District Council. £200 per annum.—Mr. R. A. Colenutt, clerk, Council Offices, New-road, Portland.

ASSISTANT ENGINEERS.—East Africa Protectorate Public Works Department. £300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Government of the Gold Coast, Public Works Department. £350—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

TEMPORARY DRAUGHTSMAN.—Corporation of Southend-on-Sea.—Mr. Ernest J. Elford, borough engineer and surveyor.

ENGINEER AND SURVEYOR'S ASSISTANT.—Friern Barnet Urban District Council.—Mr. E. J. Reynolds, engineer and surveyor, The Priory, Friern Barnet-road, N.

CLERK OF WORKS.—October 8th.—The Valley (Anglesey) Rural District Council. £2 10s. per week.—Mr. O. J. Hughes, clerk.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon* on Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

RATHDRUM.—October 11th.—For a scheme of water supply from Ballinderry Brook, for the Rathdrum Rural District Council. Prize of £50.—Mr. P. W. Sheehan, clerk, Workhouse, Rathdrum.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon* on Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

WEST RIDING.—October 3rd.—For the erection of a school for the Education Committee.—Education Architect, County Hall, Wakefield.

SHEFFIELD.—October 3rd.—For the execution of works in connection with the covering of the river Sheaf, including bridge widening, new weir, new bridge, retaining wall, and new street, for the corporation. City Engineer.

DARTFORD.—October 3rd.—For the extension of the electricity works, for the urban district council.—The Surveyor.

BRADFORD.—October 3rd.—For the erection of a branch library, for the corporation.—City Architect.

BLACKBURN.—October 5th.—For the erection of a dispensary, for the corporation.—Mr. W. Stubbs, borough and water engineer.

EXETER.—October 5th.—For the erection of fourteen blocks of houses and flats, for the corporation. City Surveyor.

HEYWOOD.—October 5th.—For extensions to electricity works, for the corporation.—Mr. J. B. Nuttall, borough surveyor.

DEVIZES.—October 5th.—For the erection of six workmen's dwellings, for the rural district council.—Mr. T. V. Trumper, Ivy House, Devizes.

WEYBRIDGE.—October 5th.—For the supply of granite, broken flints, gravel and screenings, and team labour, for the urban district council.—Mr. J. S. Crawshaw, surveyor.

SHREWSBURY.—October 5th.—For the erection of piggeries and public conveniences, for the corporation.—Mr. A. W. Ward, borough surveyor.

KEIGHLEY.—October 6th.—For foundation and levelling work for new garage, for the corporation.—Mr. H. Webber, borough electrical engineer.

LEEDS.—October 6th.—For additions to sanatoriums and hospital, for the corporation.—Mr. W. T. Lancashire, city engineer.

SWANSEA.—October 6th.—For private street works, for the corporation.—Mr. G. Swarbrick, acting borough surveyor.

TOTTENHAM.—October 6th.—For resurfacing a roadway, for the urban district council.—Mr. W. H. Prescott, engineer.

SEVENOAKS.—October 6th.—For the erection of sixteen cottages, for the urban district council.—Mr. S. Towlson, surveyor.

HUDDERSFIELD.—October 6th.—For the erection of a urinal, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

PONTEFRACT.—October 7th.—For the erection of an ambulance station, for the corporation.—Mr. John E. Pickard, borough surveyor.

GLAMORGAN.—October 7th.—For the erection of new schools and the repair of existing schools, for the county council.—County Hall, Cardiff.

STRATFORD-UPON-AVON.—October 7th.—For the erection of thirty-six workmen's cottages, for the corporation.—Mr. R. Dixon, borough surveyor.

SHEFFIELD.—October 7th.—For hospital extension, for the corporation.—City Architect, Town Hall.

COLWYN BAY.—October 8th.—For the erection of a refuse destructor, with steam boiler and auxiliary machinery complete, for the urban district council.—Mr. E. M. Lacey, consulting engineer, 12 Victoria-street, Westminster, S.W.

WARRINGTON.—October 9th.—For the erection of a school, for the Education Committee.—Mr. J. M. Murray, secretary, Education Office.

HINCKLEY.—October 10th.—For laying about 4 miles of water mains, erection of a workshop, and approach road, and the provision and fixing of wrought-iron fencing, for the rural district council.—Mr. E. H. Crump, engineer, Hinckley.

LANCASHIRE.—October 10th.—For the erection of a police station, for the Standing Joint Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

MANCHESTER.—October 10th.—For the erection of a school, for the corporation.—Education Offices.

CORNWALL.—October 10th.—For the erection of a new school and additions to existing school, for the Education Committee.—Mr. S. Hill, architect, Greenlane, Redruth.

WALLASEY.—October 13th.—For the erection of tramway workshops, for the corporation.—Borough Engineer and Surveyor.

WEST SUSSEX.—October 13th.—For the erection of new schools and alterations to existing schools, for the Education Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

COLWYN BAY.—October 15th.—For the erection of an electric power station, for the urban district council.—Mr. E. M. Lacey, 12 Victoria-street, Westminster.

LEICESTER.—October 17th.—For the supply and erection of steel plate girders and steel troughing, and the widening of Bow Bridge over the river Soar, for the corporation.—Borough Surveyor.

COSFORD.—October 17th.—For the construction of a brick tower, laying water mains, standpipes, valves, and other works, for the rural district council.—Mr. C. Dudley Bright, Polstead Heath, Polstead, Suffolk.

GODSTONE.—October 17th.—For the erection of ten working-class dwellings, for the rural district council.—Mr. T. C. Barralet, surveyor.

LONDON.—October 20th.—For the extension of engine-house, boiler-house, coal store, and other works, for the county council.—Chief Engineer.

MANCHESTER.—October 21st.—For the restoration of the embankments of the Audenshaw reservoirs, for the corporation.—Messrs. G. H. Hill & Sons, Albert Chambers, Albert-square, Manchester.

IPSWICH.—October 22nd.—For the erection of public health offices, for the corporation.—Mr. J. R. Mead, borough engineer and surveyor.

WEST HAM.—October 27th.—For the extension of the asylum, Goodmayes, Essex, for the corporation.—Borough Engineer, Town Hall.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

BRADFORD.—October 7th.—For the duplication of seven pipe syphons, the supply of 7,500 tons of cast-iron pipes, and the supply of 900 tons of mild-steel pipes, for the corporation.—Mr. J. Watson, waterworks engineer, Town Hall.

SOUTHEND-ON-SEA.—October 8th.—For the supply of approximately 200 tons of 8-in. diameter cast-iron spigot and socket pipes, for the corporation.—Mr. Ernest J. Elford, borough engineer.

GRAYS THURROCK.—October 8th.—For the supply of 680 lin. yds. of wire fencing, with wrought-iron standards, and four wrought-iron field gates, for the urban district council.—Mr. A. C. James, surveyor.

Roads.

KIRKCALDY.—October 3rd.—For laying a road with granite setts, for the corporation.—Burgh Surveyor.

TANGIER.—October 3rd.—For road construction, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

BATTERSEA.—October 5th.—For the supply of materials and works for resurfacing roadways and asphalt-macadam, for the borough council.—Mr. Marcus Wilkins, town clerk.

PRESTWICH.—October 5th.—For work of road improvement, for the urban district council.

WHEATLEY.—October 6th.—For work of road construction, for the urban district council.—The Surveyor.

SALFORD.—October 6th.—For paving, flagging and sewering works, for the corporation.—Borough Engineer.

BEDLINGTON.—October 6th.—For the supply of 5,000 tons of hand-broken road whinstone, for the urban district council.—Mr. J. E. Johnston, surveyor.

NEWPORT (Mon.).—October 7th. For private street works, for the corporation.—Borough Treasurer.

HORNSEY.—October 7th.—For making good a passage, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

ASHTON-IN-MAKERFIELD.—October 7th. — For private street works, for the urban district council.—Mr. T. Burgess, surveyor.

HENDON.—October 8th.—For making up Love-lane, for the rural district council.—Mr. J. A. Webb, surveyor.

PAIGNTON.—October 8th.—For paving footpaths with concrete, and contingent works, for the urban district council.—The Surveyor.

BARCELONA.—October 9th.—For street paving works, for the municipality.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

KESTEVEN.—October 10th.—For the supply of granite, slag chippings and rejections, gravel, and tarred macadam, for the county council.—Mr. W. B. Purser, county surveyor, Grantham.

WANDSWORTH.—October 12th.—For the repair of part of Wimbledon Park-road, Mount Ephraim-lane, Gatton-road, and Idlecombe-road, for the borough council.—Mr. P. Dodd, borough engineer.

LONDON.—October 13th.—For paving works with creosoted deal blocks, for the county council.—Mr. G. W. Humphreys, chief engineer, Spring-gardens, S.W.

STOKE-ON-TRENT.—October 14th.—For making up certain streets, for the corporation.—Borough Surveyor.

ROCHDALE.—October 14th.—For making good part of a street, for the corporation.—Borough Surveyor.

SOUTHEND.—October 14th.—For making up a certain road and passages, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

HARROW.—October 17th.—For widening and surfacing, and laying out an open space, for the urban district council.—Mr. J. P. Bennetts, engineer and surveyor.

Sanitary.

BANBURY.—October 3rd.—For the construction of about 1 mile of 18-in., 15-in., and 9-in. cast-iron and stoneware pipe sewers, with manholes, storm overflow chamber, erection of engine-house, refuse destructor-house, and other works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

WATH-UPON-DEARNE.—October 3rd.—For the alteration and reconstruction of the sewage disposal works, for the urban district council.—Mr. J. H. Drew, engineer.

MANCHESTER.—October 3rd.—For the supply of graded slag, stoneware pipes, best bends, stoneware covers, and stoneware underdrainage tiles, for the Rivers Committee.—Secretary, Town Hall.

BISHOP AUCKLAND.—October 5th.—For the supply of disinfectants, for the rural district council.—Dr. Penfold, medical officer of health, 9 Craddock-street, Bishop Auckland.

BILLERICAY.—October 5th.—For the construction of a pipe sewer and manholes, for the rural district council.—Mr. R. J. W. Leyland, surveyor.

WEST LANCASHIRE.—October 5th.—For sewerage extensions, for the rural district council.—Mr. A. Dickinson, clerk.

ROYSTON.—October 7th.—For alterations to sewers, manholes, and ventilators, and the construction of flushing tanks, for the urban district council.—The Surveyor.

TUTBURY.—October 8th.—For the construction of sewers and connections, and repair of drains, for the rural district council.—Mr. H. S. Tebbitt, surveyor.

PRESTON (Lancs).—October 9th.—For taking up earthenware pipes and relaying in cast-iron and earthenware socket pipes, for the rural district council.—Messrs. Myres, Veevers & Myres, 15 Chapel-street, Preston.

SOUTHPORT.—October 10th.—For a supply of salt-glazed vitrified stoneware socket-jointed pipes, bends, junctions, and gullies, for the corporation.—Mr. A. E. Jackson, borough engineer and surveyor.

ROMFORD [illegible] 1710. For the construction of [illegible] M. W. [illegible] Clerk.

LEEDS [illegible] 2103. For the [illegible] for the corporation.—Mr. Geo. A. Hart, sewerage engineer.

BIRMINGHAM [illegible] tion of main outfall sewer, for the Sewerage Board. —Messrs. Willcox & Raikes, 63 Temple-road, Birmingham.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted

ASHTON-UNDER-LYNE.—The following tenders have been accepted by the corporation.—Mr. J. Rowbottom, engineer:—
Contract No. 1: Sludge Press.—Monkvale, Abbott & Co., Nottingham.
Contract No. 2: Pumps.—P. Pilkington & Co., Bamber Bridge.
Contract No. 3: Travelling Distributor.—Ames-Crosta Sanitary Engineering Company, Nottingham.
Contract No. 5: Filter Tiles.—Naylor Brothers, Denby Dale.
Contract No. 6: Filtering Media.—C. L. Stiff & Co., Birmingham.

BROMSGROVE.—For the construction of 536 lin. yds. of 6-in. stoneware pipe sewers, with manholes, ventilating columns, and other works, for the rural district council. Mr. Robert Green, engineer, Birmingham:

G. Law, Kidderminster	£479
J. White, junr., Handsworth	422
W. Thorpe, Hollywood	415
Tilt Brothers, Bromsgrove	353
Childs & Withers, Willenhall	342
Martin & Element, Smethwick *	333

CARLISLE.—For laying 1,200 yds. of 3-in. water main, for the rural district council.—Mr. F. Barker:—

W. Ferguson, Silloth	£211
Oliphant & Co., Carlisle	210
Thomson & Sons, Carlisle	205

ENFIELD.—For making up Waverley-road, Crescent-road, and Old Park-road, for the urban district council.—Mr. R. Collins, surveyor:—

WAVERLEY-ROAD.

Jennings & Grenfell, Waltham Cross	£1,087
E. Greenfield, Bush Hill Park	1,020
E. J. Betts, Enfield Highway *	965

CRESCENT-ROAD.

Jennings & Grenfell, Waltham Cross	£555
E. Greenfield, Bush Hill Park	500
E. J. Betts, Enfield Highway *	485

OLD PARK-ROAD.

Jennings & Grenfell, Waltham Cross	£982
E. Greenfield, Bush Hill Park	860
E. J. Betts, Enfield Highway *	835

HINCKLEY.—For the supply of cast-iron water pipes, for the Burbage water scheme.—Mr. E. H. Crump, surveyor and water engineer:—

Jordans, Limited, Newport	£1,614
Clay Cross Ironworks Company, Chesterfield	1,527
Sheepbridge Ironworks Company, Chesterfield	1,513
Holwell Ironworks Company, Melton Mowbray	1,511
Cochrane & Co., Dudley	1,510
Staveley Ironworks Company, Chesterfield	1,499
Stanton Ironworks Company, Nottingham *	1,486

HINCKLEY.—For the supply of hydrants, valves, &c., for the Burbage water scheme.—Mr. E. H. Crump, surveyor and water engineer:—

G. Waller & Sons, Stroud	£255
Ham, Baker & Co., Birmingham	251
Stone & Co., London	242
Glenfield & Kennedy, Kilmarnock	236
Bird & Co., London	213
Blakeborough & Sons, Brighouse	211
Hamilton, Woods & Co., Salford *	201

SUNBURY.—For the reconstruction of two roads, for the urban district council.—Mr. H. F. Coales, engineer:—

E. Free & Sons, Maidenhead	£15,384
S. Kavanagh & Co., Surbiton Hill	14,934
J. Mowlem & Co., Westminster	14,485
Franks, Harris Brothers, Limited, Guildford	13,858
D. T. Jackson, Barking	13,833
E. Parry & Co., Putney	13,669
W. Manders & Co., Leyton	12,975
Road Maintenance Company, London	12,929
Langley & Johnson, Slough *	12,089

SHIPLEY.—For construction of work at the sewage disposal works, for the urban district council. Messrs. M. Paterson & J. N. Nicholson, Bradford:

W. & J. Kendall, Pudsey	£1,585
Ward & Tetley, Bradford	1,488
[illegible] & Sons, Bradford	1,250
J. & P. [illegible], Bradford	1,162

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER

3.—Institution of Municipal and County Engineers: East Midland District Meeting at Hinckley.

24.—Royal Sanitary Institute: Meeting at York. Discussion on "Biological Treatment of the York Sewage."

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ARTICLED PUPIL. Vacancy occurs in office of a County Engineer and Surveyor. For full particulars apply Box 1,467, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,943)

THE URBAN DISTRICT COUNCIL OF PORTLAND.

The above Council invite applications for the post of Engineer and Surveyor to their district.

The person appointed will be required to act and to carry out all the duties appertaining to the office of a Surveyor to a District Council, and also Engineer to their Waterworks Undertaking, and to devote his whole time to the service of the Council. He will also be required to attend meetings of the various Committees and Council which are held in the evenings.

The salary will be £200 per annum.

Duties to commence on the 1st December, 1914.

Three months' notice to terminate engagement to be given by the person appointed.

Applicants must have had experience of a Municipal Waterworks Undertaking, and in his application must state age, qualifications and previous experience.

Accompanying the application there must be twenty copies of it, and the same number of not more than three recent testimonials. These must reach my office by 1 o'clock p.m. on the 13th October next, endorsed "Surveyor."

Canvassing members, directly or indirectly, will disqualify a candidate.

R. A. COLENUTT,
Clerk to the Council.

Council Offices,
New-road,
Portland.
September 29, 1914. (1,966)

WILLENHALL URBAN DISTRICT COUNCIL.
TOWN FOREMAN.

The above Council invite applications from competent persons for the position of Town Foreman.

Applicants must have a thorough knowledge of the duties to be performed, must be fully qualified in modern construction and maintenance of roads, sewers, &c., and experienced in the management of men and team labour.

Preference will be given to candidates who are cyclists.

Wages 35s. per week, with house.

Applications, in candidate's own handwriting, stating age (which must not exceed 45) and experience, together with copies of three recent testimonials, and endorsed "Town Foreman," to be delivered to me not later than Saturday, October 10th, 1914.

List of duties can be obtained from the undersigned.

Canvassing, directly or indirectly, will disqualify.

T. EDGAR FELLOWS,
Engineer and Surveyor.

Town Hall,
Willenhall.
September 22, 1914. (1,949)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. OCTOBER 9, 1914. No. 1,186.

Minutes of Proceedings.

The Hinckley Meeting. At the conclusion of the East Midland District meeting of the Institution of Municipal and County Engineers which was held at Hinckley on Saturday last, Mr. E. H. Crump, Assoc.M.Inst.C.E., the engineer and surveyor to the urban district council, was warmly congratulated upon the great success which had attended the gathering. The proceedings were noteworthy for the many tributes, thoroughly well deserved, to the excellent work he has accomplished since taking up his present appointment. Mr. Crump's paper, entitled "Eleven Years' Municipal Work at Hinckley," was of considerable interest, and contained an account, at once exhaustive and concise, of the principal works carried out during the period named. The historical associations of Hinckley and its neighbourhood are unusually interesting, and some account of them formed an appropriate introduction to the paper. Among the more important questions discussed was that of the provision of workmen's cottages, and Mr. Crump gave an account of a scheme now in course of execution for the erection of twenty-eight dwellings, upon which it is estimated that there will be a very trifling annual loss after paying the instalments of principal and interest and other outgoings. He spoke with some diffidence on the question of policy, but we entirely agree with his opinion that in a district such as Hinckley, where working-men's houses are urgently required and private enterprise does not provide them, it is the duty of the local authority to build, even if the rental charged is less than it would be if the houses were erected by a speculative builder.

Among the most difficult problems which the council have had to face in recent years are those connected with sewerage and sewage disposal. In the first place, the old main sewer was in such a bad condition that a burst was not an uncommon occurrence. This has been remedied by the construction of a new outfall sewer consisting of oviform concrete tubes, the works having been designed by Mr. Crump and carried out under his supervision. The difficulty of treating the sewage may be gathered from the fact that over one-third of the total dry-weather flow consists of the waste from the dye and dry-cleaning works. The proportion of chemical refuse is therefore exceedingly high, and consequently not only is the final effluent of poor quality, but it is also dark in colour and so peculiarly liable to produce complaints. Experimental percolating beds have now been put down with the object of ascertaining whether a colourless and satisfactory effluent can be obtained by passing the sewage through a primary and secondary bed without using any lime, which has the effect of solidifying the filtering medium. In addition to the sewage disposal works, the council own the gasworks, public baths, cemetery, free library, and waterworks. In regard to the last-named undertaking, a gradual decrease in the available supply led Mr. Crump to recommend the council to proceed with the driving of certain headings, and after consulting Messrs. Hawkesley, under whom the original scheme had been carried out, it was decided to undertake this work, Mr. Crump acting as resident engineer. During the period reviewed in this paper the surveyor's department has carried out a considerable amount of work of a more routine character in connection with streets and roads, new streets, private streets, street improvements, sanitation, recreation grounds, and other matters. The general impression left by last Saturday's visit was that the present condition of the district shows what can be done by an enlightened council in conjunction with a well-qualified and energetic engineer.

* * *

Chiswick Rifle Range. The establishment of a ratepayers' rifle range at Chiswick, the formal opening of which was reported in our last week's issue, seems to deserve, and indeed to demand, some special comment. Assuming that the object is laudable, commendation is certainly due for the conception of the idea and for the promptitude and thoroughness with which it has been carried out. It was stated by one of the principal speakers that the original suggestion came from a private in the Territorials. The suggestion was adopted by the local Chamber of Commerce, at whose request the urban district council granted a site at a merely nominal rent and an open corrugated-iron shed for conversion into a range, and the council's energetic engineer, Mr. Edward Willis, acted as honorary surveyor for the reconstruction scheme. The cost of erecting the range has been defrayed by donations, so that the question of using the

[illegible] while the [illegible] of its present [illegible] to the [illegible] of the [illegible] [illegible] Chiswick [illegible] [illegible] [illegible]

The Study of Town Planning.

The important part which town planning is destined to play in the future development of towns and cities is now generally recognised. Much has already been accomplished since the Act of 1909 came into operation, and the advocates of compulsion are beginning to make themselves heard. It is evident therefore that the well-equipped municipal engineer of to-morrow ought, in addition to his other qualifications, to have had some systematic training in the laying out of towns. The announcement that a department of town planning has been established in connection with the University of London School of Architecture, and that Mr. S. D. Adshead, M.A., F.R.I.B.A., has been appointed as the first professor, will therefore be welcomed by those who desire thoroughly to train themselves for the new duties which they may have to undertake in the near future. In a circular announcing the several courses, Professor Adshead outlines the principles upon which the instruction will be based. While the Town Planning Act deals exclusively with the development of land likely to be used for building purposes, and while town planning, as a subject included in the curriculum of a university, must treat the subject in a much broader way, at the same time the immediate importance of the operations of the Town Planning Act in this country justifies the department in arranging its courses of study so as to have some special reference to procedure under the Act, and while the Town Planning Act and other Public Health Acts have very little practical bearing on those purely architectural issues which are involved in the reconstruction and extension of towns, the result will prove disastrous unless the matter is considered from the point of view of elevation as well as plan. In the realisation of a town plan it is the complete effect of the architecture, as well as the underlying arrangement of the streets, that counts. The foundation of a school of town planning in London should attract not only students who may be permanently resident in the Metropolis and its vicinity, and who may be desirous of availing themselves of the advantages of a university training in this subject, but also many from the provinces and abroad who are able to spare the necessary time.

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By-laws and Housing.

The paper on "By-laws and the Housing Question," which Mr. W. H. A. Court, ASSOC.M. INST.C.E., of the borough engineer's department, Leicester, read at Hinckley last Saturday, consisted in the main of a shrewd and practical defence of the model code. In analysing the influence of by-law requirements on the building of cottages by private enterprise, Mr. Court pointed out that the possibility of producing a remunerative scheme depends not only upon the cost of the building proper, but also upon the cost of the site, which is not affected by the by-laws, and the cost of road making. It has been suggested in many quarters that the actual cost of building might be reduced either by a general modification of the requirements of the by-laws, or at least by rendering the by-laws flexible so that they can be adapted to the circumstances of particular cases. The matter is one in regard to which there has been a good deal of general discussion without a true appreciation of the real considerations involved. It must be borne in mind that the existing code represents what have hitherto been deemed to be the minimum requirements to secure stability and to safeguard the public health. In certain districts, no doubt, antiquated by-laws need revision, and the Local Government Board have taken steps to urge on this work. With regard to road making, we think that a better case for relaxation can be made out. Mr. Court urges as an argument in favour of the retention of existing requirements that the admittedly high cost of construction is balanced by the comparatively low cost of subsequent maintenance, repair, and cleansing. It must not be forgotten, however, that the cost of construction falls upon one body of persons—namely, the frontagers—whereas the cost of maintenance falls upon another distinct body of persons—the general ratepayers. It is often a difficult matter to hold a fair balance between the two, and we are by no means sure that a uniform application of model by-law requirements in regard to road making does not in many cases cause appreciable hardship upon the former.

* * *

Municipal Housing and Distress.

The minds of many surveyors and others have been much exercised by what has come to be a very general opinion as to the suitability of the erection of workmen's cottages as works which may be undertaken by a local authority with a view to relieving distress. Some official sanction has been given to this opinion by reason of the fact that at the outbreak of the war the Government allotted a large sum of money to be devoted to assisting local authorities to finance housing schemes. It is of course assumed that such works will not be undertaken unless a real need exists for more cottages in the district, but even where this condition exists, what proportion of the total sum spent on each trade goes to pay for labour? A suggestion has reached us from an influential quarter that reliable information on this point at the present juncture would be not merely interesting, but really valuable; and, feeling sure that many of our readers who have themselves carried out housing schemes must have such information in their possession, we venture to ask that they will send it to us for publication in the common interest. It is suggested that information regarding a semi-detached cottage, built in a medium-sized or small provincial town at a cost of about £200, reckoned on a basis of 4¾d. per foot cube, apart from levelling and fencing, but including drainage, would be specially useful. We trust that the urgency and importance of the matter will produce a ready response to our correspondent's request.

* * *

Sanitation and War.

The letter from Captain Arthur J. Martin, of the 2nd London Sanitary Committee, which appears on another page of this issue, should be the means of inspiring many of our readers with the answer to the question that so many of us are now asking—"What can I do at this crisis to help my country?" It is evident that the sanitation of our numerous camps is of the utmost importance. It is impossible to gather together large bodies of men without some risk of epidemics, unless proper precautions are taken, and it is on these lines that volunteers are required to assist in the sanitation of our home camps. There must be a large number of men, who have more or less knowledge of sanitation, who would greatly benefit by at once enlisting in this Sanitary Company for home service. They would not have to go abroad, and the experience they would gain would be invaluable to them in after life. This is an opportunity for patriotism and self-advancement combined that does not often occur in a man's life, and we feel confident that there will be a very general response to this appeal.

Institution of Municipal and County Engineers.

EAST MIDLAND DISTRICT MEETING AT HINCKLEY.

MUNICIPAL AND COUNTY ENGINEERS AT SNARESTONE WATERWORKS.

M[illegible] East Midland District, has every reason to be grati[illegible] of the Saturday's meeting of the Institution of Municipal and County Engineers in the progressive Leicestershire town which he serves [illegible] surveyor. Although officially described as a district, as distinct from an ordinary meeting, the president, Mr. J. S. Pickering, and many other prominent members from distant parts of the country, were among the company of seventy or more who attended the gathering, which opened at the offices of the district council shortly before mid-day. Two papers: "Eleven Years' Municipal Work at Hinckley" and "By-laws and the Housing Question," by Mr. Crump and Mr. W. H. Court, ASSOC.M.INST.C.E., Leicester, respectively, were submitted for discussion, and the afternoon was devoted to an interesting round of [illegible] inspection of the Snarestone waterworks, about 14 miles from the town. There was one unlooked-for difficulty, for the surmounting of which [illegible] due to Mr. Crump. During luncheon it transpired that the motor chars-a-[illegible] had been ordered for the journey had been unexpectedly requisitioned by the military, and it says much for the promptitude with which Mr. Crump dealt with the situation when it is stated that when the time came for departure he had managed—[illegible] an [illegible] amount of trouble—to secure nearly thirty cars in the place of the commandeered vehicles. No fewer than a dozen private cars were placed at the disposal of the members, and the remainder were hired from various garages. Without the private vehicles, however, it is somewhat doubtful whether the visit could have taken place, and it is fitting, therefore, that the action of the owners should not pass unrecorded. Other undertakings inspected in the course of the day were the public baths adjoining the council offices and the workmen's dwellings which have been erected, or are in course of erection, under Mr. Crump's superintendence; and a visit which was paid to Gopsall Park Gardens, by the permission of Earl Howe, brought to an end a meeting which was as enjoyable as it was instructive to those who participated in it. The attendance included Messrs. L. Baldwin (Coalville), F. Bennett (Leicester), R. Blanchard (Cannock), A. Carter (Oakham), W. G. Clarke (Wigston), H. Coleby (Atherstone), F. C. Cook (Nuneaton), W. H. Court (Leicester), H. Coales (Market Harborough), G. E. Clarke (Boston), E. H. Crump (Hinckley), S. Douglas (Kenilworth), G. E. Fryer (Melton Mowbray), E. J. Goodacre (Shrewsbury), A. D. Greatorex (West Bromwich), T. W. Hayward (Battersea), E. Jeeves (Melton Mowbray), G. Killick (Finsbury, London), T. Lake (Bourne), F. W. Mann (Leicester), R. MacBrair (Lincoln), R. Moon (Nuneaton), W. Moorhouse (Melton Mowbray), T. Negus (Meriden), W. Plant (Stafford), J. S. Pickering (Cheltenham), G. Pearson (Marlborough), A. G. Ross (Lutterworth), G. Rawson (Worksop), S. Turner (Ashby), F. Tyson (Leicester), T. Wood (Leicester), A. H. Walker (Loughborough), W. S. Woodcock (Oakham), H. G. Whyatt (Grimsby), F. Wright (Ilkeston), members; A. S. Atkins (Hinckley), A. Abbott (Hinckley), J. Bennett (Hinckley), J. Burnett (Nuneaton), P. Benn (Lichfield), W. H. Bott (Hinckley), W. Bray (Hinckley), G. Cholerton (Hinckley), G. Featherston (Worksop), J. S. Featherston (Hinckley), W. Greatorex (West Bromwich), Dr. Bostock Hill (Birmingham), T. Harrold (Hinckley), C. Hands (Burbage), F. Harris (Charlton Kings), W. Johnson (Hinckley), W. Keay (Leicester), G. Kinton (Hinckley), F. Lee (Hinckley), D. W. Lansdown (Hinckley), A. Mitchell (Charlton Kings), A. W. Oakey (Leicester), J. W. Preston (Hinckley), J. Pratt (Hinckley), Dr. Robinson (Leicester), F. A. Simmonds (Hinckley), F. Tuckey (Earl Shilton), W. Veasey (Hinckley), G. Woodston (Snarestone), G. Walker (Nuneaton), F. Warner (Birmingham), W. Warner (Hinckley), J. Warner (Hinckley), T. Williams (Nuneaton).

Mr. G. KINTON, chairman of the urban district council, gave the members a hearty welcome to Hinckley. They felt that the institution had paid the town a very great compliment in deciding to hold their meeting in Hinckley. They knew how very dependent they were upon the labours of municipal engineers for the health and welfare and comfort of the community, and they sincerely hoped that the interchange of ideas would be for the benefit of the public. Hinckley, though small, was a progressive and prosperous town from the industrial point of view.

Mr. W. H. BOTT, a member of the council, also joined in the welcome to the institution.

The PRESIDENT (Mr. J. S. Pickering) said that it was his privilege to thank the chairman and the council very heartily for the kind reception they had given them. He was engineer and surveyor to the neighbouring town for many years, and he had something to do with the training of Mr. Crump and his predecessor, both having been very valued assistants of his own. Both Mr. Cook and Mr. Crump had by their

efforts won the high opinion of the Hinckley Council, and earned the esteem and respect of their fellow members of that institution. The paper prepared by Mr. Crump was undeniable testimony to the great progress the town had made. He remembered the time when Hinckley did not possess a public water supply; he also remembered the very great difficulties which had to be overcome of securing a source of supply, and their present scheme had been a very great boon to the inhabitants, and, fortunately, had proved a financial success. That could only have been brought about by an authority imbued with the determination of overcoming the great difficulties with which they had to contend. The same spirit of progress could be seen in connection with their gasworks,

Mr. G. Kinton, J.P.,
Chairman of the Hinckley Urban District Council.

their baths, and their dwellings for the working class. They as engineers recognised that none of those works could have been brought to a successful issue unless they had the advice and management of the able officials who were entrusted with the management of those undertakings.

Letters of apology for non-attendance were announced from Messrs. E. G. Mawbey (Leicester), Norman Scorgie (Hackney), H. J. Clarson (Tamworth), S. Maylan (Basford), T. Fenn (Belper) and F. Hopkinson (Worksop). It was also announced that Mr. E. P. Hooley (Notts) was on service with the Territorials.

On the motion of Mr. T. W. A. Hayward (Battersea), a vote of sympathy was passed with Mr. Mawbey, whose absence was due to illness.

ELEVEN YEARS' MUNICIPAL WORK AT HINCKLEY.

By E. H. Crump, Assoc.M.Inst.C.E.,
Engineer and Surveyor to the Urban District Council

Hinckley is midway between Leicester and Coventry, and within 2 miles of the old Roman-road, the Watling-street, part of which is in the urban district. It is also within 6 miles of the High Cross, where the Fosse Way crosses, the acknowledged centre of England, as defined by the Romans.

The early days of Hinckley were mostly agricultural, as the numerous old farmyards in existence in various parts of the town revealed, less than a century ago.

The first stocking frame was introduced in 1640, gradually developing into the staple trade. The boot and shoe industry was installed in later years, and this has also become another important industry in the town. At present there are twenty-five hosiery and boot factories in the town. The well-known Sketchley dye works, although not situate in the urban district, are just beyond the boundary, and the majority of their large number of employees reside in Hinckley. There is also another dye works in the town, and at these two dye works the greater part of the hosiery manufactured in the town is dyed.

STATISTICS.

The following are the general statistics:—

Area of district, 3,729 acres.
Number of inhabited houses, 3,050.
Average number of persons per house, 4·34.
Rateable value, £47,720.
Annual amount produced by a 1d. rate, £150.
Rates: General District, 4s. 8d.
Poor, 3s. 10d.
Water, 1s. 6d.
Total, 10s. in the £.
Height above sea level at lowest part of district, 300 ft.
Height above sea level at highest part of district, 450 ft.
Death-rate last year, 13·1.

The population in 1881 was 7,673; in 1901, 11,304; in 1911, 12,838; and the estimated population is now about 13,250, thus showing that the growth of the town is gradually on the increase each year.

The council own the gasworks and waterworks, and also have their own sewage disposal works, public baths, cemetery, and free library.

STREETS AND ROADS.

The total length of roads repairable by the council is about 15 miles, and of these 2½ miles are main roads, towards the maintenance of which the county council contribute £150 per mile per annum.

The whole of the stone used in repairing these roads is obtained from the neighbouring quarries of the Enderby and Stoney Stanton Granite Company, Limited, and the Mountsorrel Granite Company,

Mr. E. H. Crump, Assoc.M.Inst.C.E.,
Engineer and Surveyor to the Hinckley Urban District Council.

Limited, which are only 4 miles distant, and from which the stone is hauled direct on to the roads.

During the past four years various experiments have been tried in the coating of roads with bituminous material, the author being of opinion that every surveyor should himself experiment to ascertain which is the best and most economical method of road making for his particular district.

The following experimental portions have been laid down:—

3-in. coating of quarrite material at 2s. 10d. per square yard.
3-in. coating of tarred slag at 2s. 8d. per square yard.
3-in. coating of granite, tar and pitch grouted, at 1s. 7d. per square yard.
3-in. coating of tarred limestone at 2s. 7d. per square yard.
3-in. coating of tarred granite at 2s. 6d. per square yard.

Sufficient information has not yet been obtained to state definitely which method is the best for this district.

It must be confessed that one or two lengths have been failures. However, the author feels satisfied that such experiments were made, as it taught him not to proceed any further in the methods which proved rather disastrous.

[illegible] found necessary last year to resurface it in the middle.

One great drawback in the Hinckley roads towards [illegible] and consequently, when tarred or resurfaced with tarred material, are rather dangerous in wintry weather.

[illegible] vours, as economically as possible, to lower the crown of the roads by scarifying the surface, removing the dirt and dust, and replacing the screened stone.

Up to the present the experiments led the author to believe that, for an urban district like Hinckley,

Mr. A. S. Atkins,
Clerk to the Hinckley Urban District Council.

where the traffic is not very excessive and where initial cost is a very important item, seeing that a 1d. rate only produces about £150, a good serviceable road can be obtained by a layer of granite laid in the water-bound method, such surface being tar-sprayed twice after the road has become quite dry, and also that the tar-spraying of roads as quickly as possible after the road has been repaired and becomes dry considerably enhances the life of a road.

There is no doubt that all district surveyors would like to pave the whole of their roadways with a proper bituminous material, but the initial outlay is always the barrier, whereas a road can be surfaced and doubly tar-sprayed for a matter of 1s. 6d. per square yard.

The argument that a bituminous road lasts three or four times longer than a water-bound road is no doubt correct, but the fact still remains that the initial outlay of the former cannot be undertaken by smaller authorities.

The experiments with the tar and pitch grouted methods have not proved altogether successful, the nuisance experienced from the "weeping" of the road in hot weather, and the complaints received concerning damaged carpets and dresses have definitely deterred the author from attempting any similar work in the future, yet at the same time it is only fair to state that the experimental portions, although having been laid down now three years, show very little signs of wear.

Hinckley during the past eighteen months has been in the unfortunate position of having most of the roadways and footways in the town disturbed by the new electric and telephone cables laid down by the Electric Power Company and the Post Office Department, consequently the streets do not possess such a neat and level appearance as the author would like. The work of reinstatement of these trenches is undertaken by the council, the whole expense being borne by the authorities making the trenches.

Most of the roads in the town are tar-sprayed, the [illegible] amounting to approximately 5 miles, at a cost of 1d. per square yard.

Distilled tar is used, the material being obtained from the council's gasworks, at the rate of 3d. per gallon, or £2 10s. per ton, a proper still having been erected by the manager for this purpose. Granite chippings are used for binding the surface after the spraying, and the whole of the work is carried out by machines manipulated by the council's workmen.

During the past few years many of the footpaths of the town, which formerly were of roughly dressed setts, &c., have been repaved, either with tarred limestone or concrete slabs, and properly kerbed [illegible] A sum of £2,000 is spent in this direction last year, and there still remains a fair amount of new work to be done, but with other larger schemes on hand the council have been compelled to postpone other new paving, &c., for a time.

Akonia is used as a dust layer on the streets which cannot be tarred owing to their steep gradient, and has been found most successful.

NEW STREETS.

During the past eleven years six new streets have been laid out by speculators, and all have been taken over by the council after completion, under the Private Street Works Act, 1892. All streets are 36 ft. wide, and have a 6-ft. paved footpath on either side.

The following is a brief specification required to be adhered to by the council in the formation of new streets: A 2-in. layer of ashes before the 8 in. of granite pitching is laid, then another 2 in. of ashes are placed on the pitching before the two 3-in. layers of broken granite are put on.

The ashes prevent, to a very great extent, the clay working up into the pitching and macadam, and thus no creeping is experienced when steam rolling.

The footpaths are kerbed with 6-in. by 12-in. dressed granite kerbs and four rows of 4-in. by 4-in. granite setts, and paved with 2-in. concrete slabs.

A new street, including a 9-in. sewer, paved footpaths, &c., complete costs about £4 7s. 6d. per lineal yard.

In all new streets trees are planted to improve the bare appearance, seeing that there are not many in the existing streets of the town. Limes and planes have been adopted in each case, and the cost per tree fixed, including an inexpensive guard, works out at about 7s.

PRIVATE STREETS.

At the time of the author's appointment there was a considerable number of private streets and private yards in the town, and all of these have now been properly made up and put into a good state of repair.

The streets were carried out under the Private Street Works Act, 1892, while the repair of the yards was carried out by agreement with the owners. Before the work was undertaken all the yards were paved with "petrified kidneys," which material also formed the surface of several roads in the town.

Altogether there are about twenty private yards in Hinckley, and most of these yards contain a fair number of dwelling houses, and have a public right of way through them, leading from one street to another. The paving of these yards with granite setts or tarred limestone has been completed in most cases, but a few still remain to be done. The cost of the whole of this work has been carried out at the expense of the owners, by the council, by agreement. It was not thought advisable to carry out this work under the Private Street Works Act, and it can easily be understood that a fair amount of persuasion had to be used in order to obtain the sanction of the owners, who, however, finally saw the great improvement effected in the cleanliness of the yards, and acknowledged the necessity of it.

STREET IMPROVEMENTS.

Hinckley being a very old town, many of the streets are narrow, and the council have never lost any opportunity of widening such streets when the chance arose. In most cases the owners have given up the necessary land, the council bearing all cost of new fences and the widening of the road and footpath. Since the author's appointment about £2,500 has been spent in this direction, while in one case the council purchased a site known as the Workhouse-yard, containing ten houses, at a sum of £1,000, demolished the whole of the buildings, and constructed a new street through the site, and provided an excellent connection between two important thoroughfares.

The author commends this spirit of owners in Hinckley of giving up land for street widening without payment to other towns, for the council here has always been readily and generously met by the parties owning the required land.

applications are still being received for the ones now being completed, thus showing the need for the council to proceed further in the matter.

The following is the estimated balance-sheet of the sixteen houses now in course of erection:—

ESTIMATED BALANCE SHEET.

Estimated Receipts.	£	s.	d.
Rents from 16 houses, let at 5s. per week ..	208	0	0
Less two weeks' loss of rent each 16 at 10d.	8	0	0
	200	0	0
Estimated yearly loss	2	9	1
	£202	9	1

Estimated Expenditure.	£	s.	d.
Repayment of loan, principal and interest (at 3½) in respect of:—			
(a) Land, 3,044 square yards, estimated at 2s. 9d. per square yard (£419 for 80 years)	15	13	2
(b) 16 cottages (£2,800 for 60 years)	112	5	3
District and poor rates, 16 at £1 16s. 8d. per annum	29	6	8
Water rates 16 at 13s. per annum	10	8	0
Insurance—16 at 3s. per annum	2	8	0
Property tax 16 at 9d. per annum ...	7	4	0
Yearly repairs—16 at 25s. per annum	20	0	0
Supervision and collection of rents (2s. per week)	5	4	0
	£202	9	1

SANITARY CONDITION OF THE TOWN.

Up to within fourteen years ago most of the sanitary conveniences of the town were of the privy midden and pan type.

Mr. F. C. Cook, the author's predecessor, first tackled the problem, and obtained the conversion of a number of these nuisances into water closets. The author continued the work, and has been successful in practically abolishing the whole of the privies and pans in the town, with the exception of a few isolated cases. The whole town is now provided with proper water-closets, and the old type of brick ashpit as a receptacle for ashes is now very rapidly disappearing to give place to the galvanised bin.

No portion of the cost of this conversion has been paid by the council, the owners having been persuaded to carry out the work, and in only a very few cases was it found necessary to serve statutory notices.

The whole of the refuse is tipped at the council's sewage farm and burnt, but as the site is now becoming filled up, the question of a refuse destructor is being considered. All dustbins are emptied once weekly, and trade refuse is collected at a charge of 1s. per load.

HOUSING.

The question of the provision of workmen's houses has occupied the attention of the council, especially since the Housing, Town Planning, &c., Act, 1909, came into operation; but it was not until last year that an area of 4½ acres was purchased in Coventry-road for the purposes of a small recreation ground for this portion of the town, and also for a site for workmen's dwellings. An area of 2½ acres was levelled and laid out for the recreation ground, and 2 acres were allotted for houses and a new road. The author was instructed to prepare several designs of types of houses, and the council were originally in favour of the six-roomed cottage, but the Local Government Board did not approve of this type, and houses containing five rooms were then decided upon. The area allotted for houses will, when built upon, contain twenty-eight cottages, and of these twelve are completed and occupied, and the remaining sixteen are in course of erection. The dimensions of the various rooms are shown on the accompanying drawings, and each house stands on a site of an average area of 180 sq. yds. There is nothing extraordinary in the design of the cottages except that all rooms are of a good size, well lighted and ventilated. The closets and coal-houses are under a different roof to that of the main building, as this arrangement, in the author's opinion, is preferable to these offices taking up the space out of the scullery. The division walls between the bedrooms are of "Fram" partitions, 2½ in. thick, and the whole of the paving at the rear and side of the cottages is of 2-in. concrete slabs. The houses are set back 10 ft. from the street fence line, the front garden being turfed. Each house is provided with town and soft water and gas, and the rent is 5s. per week.

There is no doubt that such houses were urgently required in the town, as there has been a marked decrease in the number of new houses erected during the past few years, such depression being general throughout the county; also a fair number of houses have been closed, either by the council or voluntarily by the owners, and demolished, and consequently the supply of new houses is quite insufficient to the demand. Over seventy applications were received from probable tenants for the first twelve houses, and daily

At present there is not a house of a weekly rental between 4s. and 6s. unoccupied in the town.

As to whether it is wise procedure for councils generally to undertake the building of cottages is not a question for the author to comment upon, but it is his opinion that in a district such as Hinckley, where working-men's houses are urgently required, and private enterprise does not provide them, then it is the council's duty to build, even if the rental charged is less than it would be if the houses were erected by speculators.

RECREATION GROUNDS.

The council possess one recreation ground of 10 acres in area, which is provided with a bandstand, swings, &c. It is now being improved by the construction of walks and shrubberies, and it is proposed to level a considerable portion of it next year, as the present condition is far from satisfactory. The other recreation ground is the one recently formed in connection with the housing scheme, and is only 2½ acres in area.

PUBLIC BATHS.

These buildings were erected from the author's design in 1910, and are very plain in character, yet at the same time are quite sufficient for the needs of the town. The buildings comprise an entrance hall, swimming-bath hall, with pond 75 ft. by 25 ft., four slipper baths, and laundry and boiler-house. There is sufficient space for additional slipper baths to be erected when required.

The heating of the swimming-bath water is by steam admitted from the deep end, and the hot water for the slipper baths is obtained from a calorifier fixed in the pipe subway.

Like most other baths in the county, the annual expenditure considerably exceeds the receipts, and for the past four years the average total expenditure, including repayment of interest and instalment of loans, has been £575, while the receipts have been £263, showing an average annual nett loss of £312, which means, approximately, a 2d. rate. The cost of the baths was: Buildings, £3,000; site, £300; or a total of £3,300.

The baths are appreciated and considerably used in the town, and are only open from April to October each year. Special facilities have been provided for bathing for the scholars of the various schools in the town. The dressing-boxes are collapsible, so that additional space is thus provided for spectators at polo matches, &c. The whole of the buildings are heated throughout by means of hot-water pipes and radiators, and the washing and laundry work is executed by steam machines.

CEMETERY.

The cemetery is about 7¼ acres in extent, and is provided with the usual chapels and sexton's house. Difficulty has been experienced with water in the excavation for graves, and the council are now considering a scheme for underdrainage. The nett expenditure after deducting all receipts per annum is about £100.

SEWERAGE AND SEWAGE DISPOSAL.

The sewerage of the district is, generally speaking, by the combined system.

Up to last year the main outfall sewer for the whole town was only 18 in. and 21 in. in diameter, and was in an extremely bad condition owing to the running sand, &c., in which it had been laid. It frequently burst and caused a collapse in the roadway, and also

a portion of the town was flooded in consequence of storms. In 1912 the surveyor was instructed to prepare a scheme for a new outfall sewer, and [illegible] and consisting of concrete tubes varying in size from 42 in. by 28 in. to 36 in. by 24 in., was laid [illegible] at a cost of about £5,200, the total length being just under a mile.

A fair amount of running sand and water was again encountered, but the work was carried out by contract in a satisfactory manner.

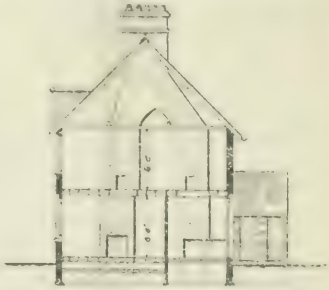
As regards ventilation of the sewers, ventilating columns are erected where necessary, and advantage has been taken of connections to one or two tall factory chimney shafts.

All drain connections to the sewers are carried out by the council at a uniform charge of 25s., paid in advance.

The council have a sewage farm, of which the following are the general particulars:—

Area of farm, 119 acres 1 rood.
High-level portion of farm, 52 acres 3 roods.
Low-level portion of farm, 66 acres 2 roods.

Front Elevation of One Block.



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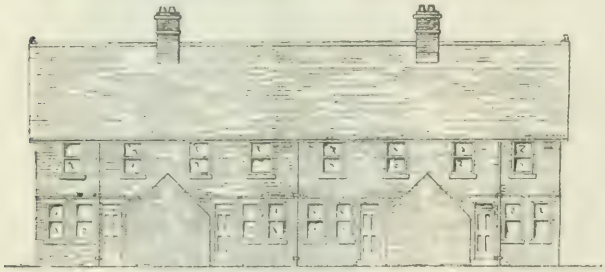
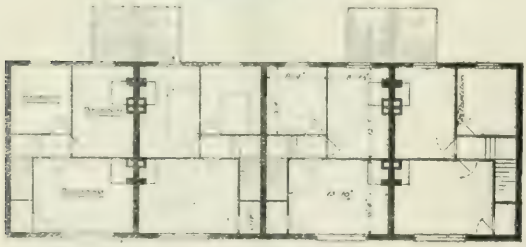
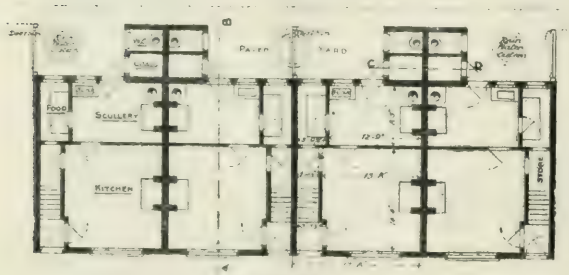


Back Elevation of One Block

Section C D.



First Floor Plan



Ground Plan.

HINCKLEY WORKMEN'S DWELLINGS.

Area of ploughed land, 51 acres.
Area of grass land, 61 acres 1 rood.
Settling tank accommodation, 350,000 gallons.
Average dry-weather flow from town, 310,000 gallons per diem.
Average daily flow treated from Sketchley Dye Works, which works are outside the urban district, 120,000 gallons per diem.
Quantity and cost of lime used per annum, 265 tons, costing £195.
Cost of gas for engines per annum, £270.
Total expenditure on farm (including £800 for repayments of loan and interest) per annum, £2,570.
Amount per annum received from the Sketchley Dye Works for treating 120,000 gallons per diem, £150.
Other receipts from grass-keeping and crops, £360.

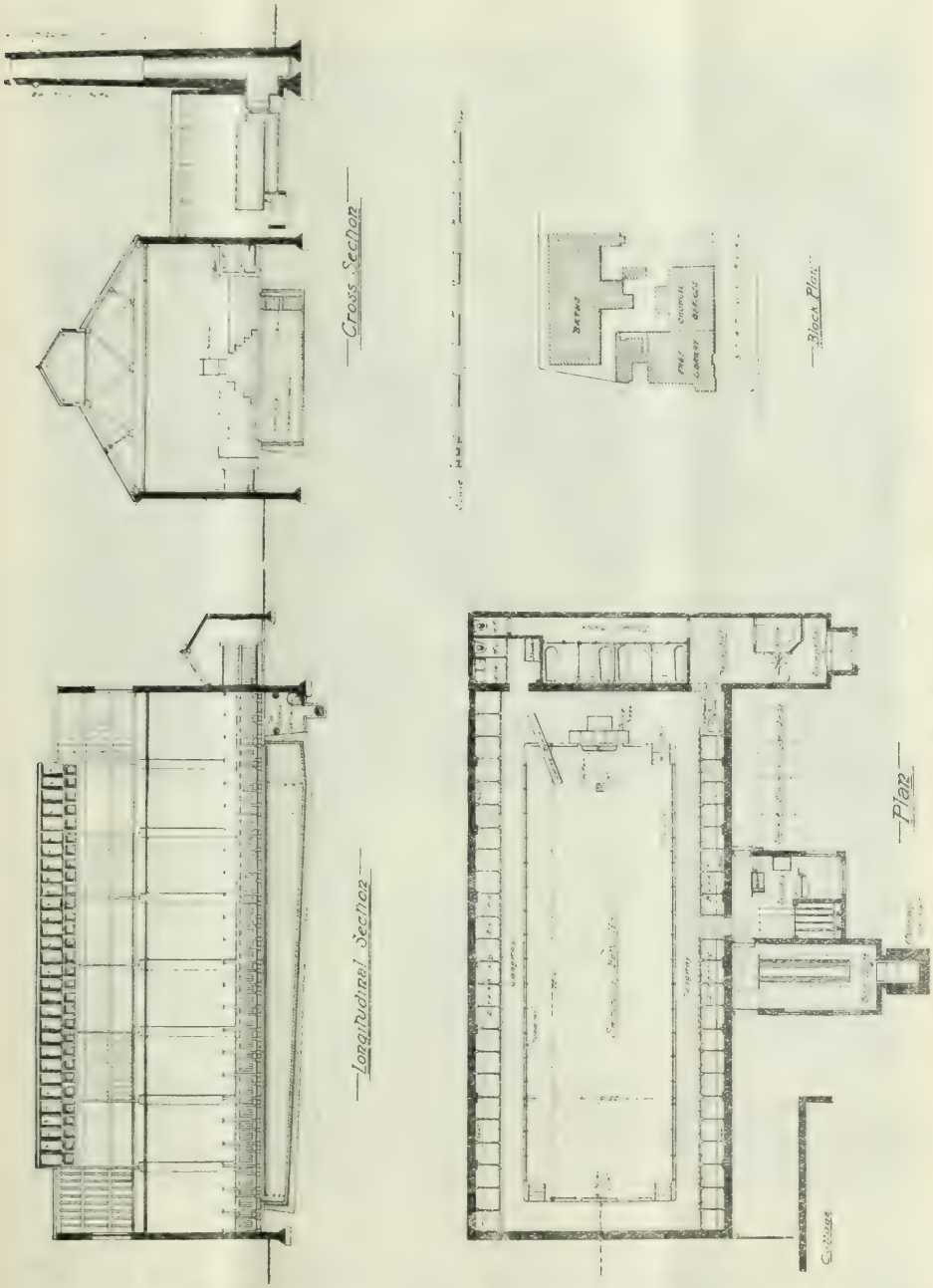
The method of treatment of the sewage is as follows:—

On arrival at the works the sewage is screened, mixed with lime water, and flows into one of the settling tanks. When the tank is filled—each tank holding about 60,000 gallons—compressed air is admitted by means of perforated pipes laid at the bottom of the tank, and thoroughly agitates the whole of the contents and mixes the existing sludge at the bottom of the tank with the sewage recently admitted, and causes an effective precipitation, and to a certain degree aërates the sewage.

The compressed air is admitted for about ten minutes, then shut off, and the sewage allowed to precipitate. After settling for an hour, the clarified sewage is drawn off by means of floating arms to a depth of about 12 in. from the bottom of the tank, this depth of sludge always remaining in until such time as the tank requires cleaning out and the accumulated sludge removed. The effect of the compressed air is

wonderful in the clarifying of the sewage, considering the most difficult sewage which has to be treated. This "blowing up" was inaugurated about three years ago by the author and Dr. Robinson, the county medical officer of health, and it is gratifying to note the improvement on the surface of the land by reason of the less amount of suspended matter now pumped up in the sewage. The effect of the blowing up is only in the clarification of the sewage and not in the purification. The sewage, after being pumped on to the high-level land, passes into the under-drains; thence it is conveyed on to the low-level land, which is also under-drained, and finally the effluent is conveyed, by means of open carriers, into the Sketchley Brook.

(To be concluded.)



Hinckley Public Baths.

We understand that Messrs. J. Baxter & Sons, Castle-street, Hinckley, who photographed the members at the Shirestone waterworks, are prepared to supply copies of the group at the usual postcard rate.

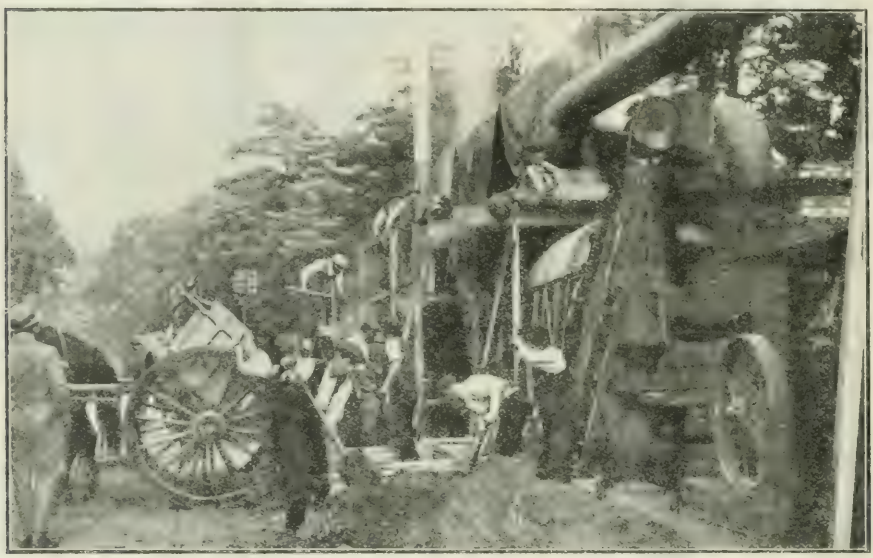
By-laws and the Housing Question.—The paper read at Hinckley by Mr. W. H. Court will appear next week.

VOIDLESS ASPHALT MACADAM ROAD CONSTRUCTION.

NEW MIXING PLANT: DEMONSTRATION AT SUNNINGDALE.

On Wednesday of last week a number of Press representatives had afforded an opportunity of inspecting the new asphalt macadam mixing plant used by Highways Construction, Limited, Finsbury-square, E.C., now in operation at Sunningdale in connection with the reconstruction of long [illegible] of road on each side of Virginia Water Lake. The visitors were accompanied by representatives of the firm, in the persons of Mr. H. F. Berry (director), Mr. Lovatt, Mr. H. G. Gray, and Mr. E. W. Delacour.

The plant operating at Sunningdale is one of a number of such plants which are at present working at Harold Wood, Putney, Wanstead, Southend, Cornwall, Bristol, and Newcastle. Further plants are being erected at other points for the manufacture of the company's voidless asphalt macadam, which has [illegible] taken a premier place among modern road systems.



The Asphalt-macadam Mixing Plant at Sunningdale.

The plant at Sunningdale represents some improvements on the original plant, securing greater mechanical efficiency, but apart from this all the above-mentioned plants work on the same principle.

The process, briefly stated, comprises the following operations:—

(1) Drying and heating the sand and stone.

(2) Mixing and delivering the material to mixing chamber.

(3) Melting, heating and adding the bitumen.

(4) Thorough mixing and delivering to carts at correct temperature.

The hot asphalt macadam is then carted away to be laid on the road at a temperature of about 300 deg. Fahr. The approximate output of the plant is from 70 to 80 tons per day, which is equal in yards super. to about 700 or 800 yds. of carpet work; or, in the case of double-coat work, 400 to 450 sq. yds.

As there are two of these plants located at Sunningdale the work is being carried out at a very expeditious rate. The object that has been kept in sight in the design of the plant has been to secure the absolute control of the grading of the asphalt macadam mixture, and of its temperature at all stages of the process. This object has been attained with such accuracy that any predetermined percentage of bitumen can be readily secured and the temperature of the materials at any stage of the process can be regulated with exactitude. The importance of this is that there is no risk whatever of the materials being overheated or burnt—a valuable feature where bitumen is concerned.

The character of the plant will be seen from the accompanying photographic views.

The process of voidless asphalt macadam road construction is now well-known to surveyors, and comprises single coat or carpet work and double coat work. In the latter case the first course contains a mineral aggregate of fairly large gauge, and when this has been rolled and shaped the carpet course is superimposed. In the single coat work only the carpet course is used. It may be mentioned that carpet work has been very successfully employed on granite setts and worn macadam roads. The thickness of the two coats is approximately 2 in. and 1 in. respectively.

Among other important contracts now being carried out by Highways Construction, Limited, the following may be mentioned:

At Essex [illegible] 5 and 6 miles of road are being laid between Romford and Brentwood.

At Sunningdale the present work comprises about 5 miles of road which are being laid under the supervision of Mr. A. Dryland, the county surveyor of Surrey; and at Southend a contract for about 7 miles of roads is being carried out. It is interesting to note that over 23,000 sq. yds. have already been laid at Southend, and the present contract is a proof of the satisfactory results of the previous work.

There are other contracts being carried out at Grove End-road, Marylebone, Chorley-road, Black Rod, at Ramsbottom, Cornwall, and Bristol.

In all the above cases the company is carrying out the entire contract, but interesting variations from these arrangements may be noted:—

(1) In the metropolitan borough of Battersea, where the asphalt macadam is delivered to the site, and the council supply the labour and equipment, the road is being constructed under the supervision of Mr. T. W. A. Hayward, the borough surveyor.

(2) The borough of Hornsey have arranged for the hire of a plant, and are themselves carrying out the entire process. In this case the borough surveyor, Mr. E. J. Lovegrove, is using as the mineral aggregate clinker from the local dust destructor crushed to a suitable gauge, and the results so far appear to be exceedingly satisfactory. Numerous further examples of the company's work are to be seen in other parts of the country.

The bitumen used is the well-known brand Mexphalte, and an inspection of the road being laid at Sunningdale reveals the efficiency of the process, while the results in service will doubtless demonstrate its durability—already proved in roads which were laid in and around London several years ago, and which at the present day look none the

water for the continuous heavy motor traffic that has been passing over them. It will be recalled that in a recent issue Mr. L. S. McKenzie, the city surveyor for Bristol, described the excellent wearing capacity of roads laid under his supervision in that city by Highways Construction, Limited.

Messrs. Highways Construction, Limited, have this year been extending their operations abroad, although these have naturally been curtailed by the war, and it may be mentioned that just prior to the outbreak of hostilities arrangements had been made for trial stretches to be laid in certain cities of Belgium, while an important contract for 1,000,000 sq. yds. has been secured for a Continental capital. Work on this contract will shortly be commenced.

It is generally agreed that bituminous roads are the highways of the future, and there is a tendency on the part of municipal engineers to acquire a mixing plant to execute their own work. Accordingly a small compact mixing plant has been devised embodying all the features of the larger apparatus at Sunningdale. This is now being manufactured and will shortly be available for hire or purchase.

Laying Voidless Asphalt-macadam.

Rolling a Section.

(The road is laid in half-width sections.)

H. S. T.—Your application duly received and having attention of authorities.

MUNICIPAL WORK IN NEWCASTLE-ON-TYNE.

CITY ENGINEER'S REPORT.

Covering an area of 8,452 acres, the city of Newcastle-upon-Tyne possesses at the present time an estimated population of 273,415. Its rateable value is £1,239,918. Of inhabited houses—each flat being counted as one house—there are 50,699. The city's highways have a total length of 253 miles, and there are 276 miles of sewers. Bridges maintained by the corporation number twenty-seven; parks and open spaces cover an area of 1,400 acres, and there are no less than 62 miles of tramways (measured as single track).

A diagram in the last-issued report of the city engineer and surveyor, Mr. W. J. Steele—from which the above statistics are extracted—indicates a somewhat remarkable change in the character of dwellings erected in the city. In 1898, of the total number of dwellings erected, 9 per cent were in self-contained houses and 91 per cent in flats, whereas last year 84 per cent were in self-contained houses and 16 per cent in flats. "Prior to 1909," observes Mr. Steele, "it seems evident that in several years more dwellings were erected than were necessary to meet the natural

increase of population, but the rapid decline in building since that year has filled up the voids at such a rate that, unless there is a marked increase in the number of new dwellings in the near future, the shortage of houses will become a serious problem."

ROADS.

Newcastle has now about 48 miles of its highways surfaced with tar-macadam. During the last five years [illegible] paving has been covered with this material, but as there remain about 100 miles of chip-paved streets, it will be many years before the whole of them can be resurfaced. "In some towns," Mr. Steele remarks, "it is claimed that modern methods of road construction will reduce the cost of maintenance of the highway, but this much-desired result will probably not be realised in Newcastle; against all the disadvantages of chip pavement it has the virtue of being a cheap surface to maintain. However, it is so unsatisfactory to the demands of modern traffic that it will not be tolerated any longer than the necessity for keeping maintenance costs within reasonable limits will permit."

The approximate total length of highway now maintained by the corporation is 253 miles. The cost of maintenance per mile, exclusive of debt charges, varies with the amount of traffic, but over the whole length, and after reducing the total mileage to a figure which makes the back streets equal in width to the front streets, it is about £131, whereas the average cost in fifteen of the large towns is £179.

REFUSE DISPOSAL.

During the year 135,238 tons of refuse were disposed of; 46,784 tons were deposited on tips within the city, 27,815 tons sent to sea, 39,141 tons burnt at the destructors, and 21,498 tons sent by rail to various farms. Exclusive of trade refuse, the house refuse amounted to 88,415 tons, and is equivalent to 6·46 cwts. per head of the population, or 34·88 cwts. per house, the cost of removal and disposal being 20·36d. per head of the population, or 9s. 1·83d. per house. The street refuse amounted to 43,430 tons, and is equivalent to an average of 171 tons per mile of highway cleansed.

TOWN PLANNING.

In the two areas for which the Local Government Board have given sanction to prepare town planning schemes, negotiations, the city engineer states, have been continued with the adjoining local authorities and the owners of land, and preliminary plans are being prepared for two additional areas, which will embrace the whole of the remaining undeveloped land within the city.

TRAMWAYS.

The maintenance of the tramway permanent way cost £8,295, or £133 per mile; in addition to ordinary maintenance, £20,631 was expended in renewals, equivalent to £333 per mile, so that the total cost of the permanent way was £28,926, or £466 per mile. Mr. Steele points out that the annual total cost of maintaining the permanent way has now reached a high figure, adding that it is doubtful if it can be reduced for many years to come. The renewals on the quick-service routes are not only tedious, but costly, owing to the necessity for a large proportion of night work.

SALFORD BOROUGH SURVEYORSHIP.

Twelve candidates for the position of borough surveyor of Salford came before the corporation Finance Committee on Wednesday, and there were selected five whose qualifications will be further inquired into before the final appointment is made by a special sub-committee.

Manchester's New Main Sewer.—The Rivers Committee of the Manchester Corporation, who are charged with the care of the drainage arrangements of the city, have received reports that the work of constructing the new main sewer is progressing satisfactorily. The scheme is estimated to cost £1,000,000, and will require several years for its accomplishment.

Protection of Water Undertakings.—We received yesterday from Mr. F. C. Uren, surveyor to the urban district council, a letter with reference to a rumour which has been circulated to the effect that a German spy had been caught attempting to introduce typhoid cultures into the Aldershot camp and town water supplies. The rumour, Mr. Uren states, is without foundation.

DEVON COUNTY ROADS.

A RECONSTRUCTION SCHEME ESTIMATED TO COST £565,000.

The Devon County Council appointed recently a Special Main Roads Committee to consider the whole question of main roads, and especially whether a policy of reconstruction, based on a loan, would not be better and cheaper in many cases than the system of making repairs from year to year, as required. This course was adopted because it was generally felt that the main road problem was one which will entail a great expenditure if the principal arteries of traffic in the county are to be brought up to the high standard which seems to be the aim of the Road Board.

It is understood that before the Special Committee met each member received a memorandum, in which it was submitted that there were no fewer than 1,000 miles of main road in the county in urgent need of thorough treatment to make it capable of carrying modern traffic. One thousand miles at the estimated cost of £1,000 per mile would bring the cost up to £1,000,000. But from the first the Special Committee did not contemplate this great scheme, for, as the memorandum itself stated, "it is no use suggesting a loan on such a scale, although the expenditure of the sum or something like it will have to be incurred some day." Reasons why such a large scheme could not be undertaken immediately included the limit of the mileage which could be withdrawn from public use at any one time and the lack of sufficient labour and staff.

Information before the Special Committee showed that there are some 300 miles of the most important main roads incapable of sustaining without very costly outlay on repairs every year the heavy weights now being put upon them. The estimated cost of making these roads capable of bearing this traffic was about £565,000, to which was added £13,000 for an urgently required widening of one road. The recommendation resolved upon by the committee was that a loan should only be raised for work in respect of which long periods of repayment are allowed, other work for which short period loans only are granted being paid for out of revenue. The estimate was, therefore, divided as follows:—

Roads.	Total estimated cost.	Short loan percentage.	Long loan percentage.
Division 1 ..	£350,000	50	50
Division 2 ..	174,000	35	65
Division 3.	41,000	40	60
	£565,000		

On this basis it will be seen that a loan of £259,000 is contemplated, subject, of course, to any grant which may be made by the Road Board. The committee decided to recommend to the county council that as far as possible loans should be raised for the reconstruction works in respect of which long loans would be granted, the money to be obtained in instalments and spread over a short period of years, and that not more shall be raised in any one year than can profitably be expended therein. They suggest that the county could probably borrow money at 3½ per cent interest, to which they add 2½ per cent as the probable sinking fund, making a total charge of 6 per cent. The committee cannot estimate the amount of the grant likely to be made by the Road Board, but they suggest that the loans raised by the council should not involve an annual charge upon the rates of more than 1½d. in the £.

The report was submitted to the meeting of the county council on September 25th, and received formally, the discussion being adjourned.

Glasgow Cleansing Department.—The annual report of the Glasgow superintendent of cleansing shows that during the year ended on May 31, 1914, the ordinary expenditure amounted to £181,726, which was an increase on the estimate of £11. The principal increases were in salaries and wages, £1,686, and in workshop materials, &c., £1,039. The revenue of the department, which was estimated at £43,300, amounted to £43,602, an increase of £302. The estimates for the year anticipated a nett cost of £138,415, but the actual result of the year's working shows the charge against assessment for general cleansing purposes to be £138,124, or a saving of £290. In the course of the twelve months 713 ashpits were replaced by 2,307 portable bins. The total amount of material collected was over 288,976 tons, or a daily average of 938 tons.

The Surveyor

And Municipal and County Engineer.

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PRO PATRIA.

[FIFTH LIST.]

We present herewith a fifth list of municipal, engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Arthur, G. J. (Miss), education office, Ealing, Territorial Force Nursing Staff, Territorial Army.

Ashfield, L., town clerk's department, Ealing, 13th Kensington Battalion London Regiment, Territorial Army.

Baker, B., chief assistant, electricity department, Morecambe Town Council, 5th King's Own Royal Lancaster Regiment.

Baxter, N., junior clerk, surveyor's department, Morecambe Town Council, 5th King's Own Royal Lancaster Regiment.

Brown, T., junior clerk, accountant's department, Morecambe Town Council, 5th King's Own Royal Lancaster Regiment.

Budgett, W. H., assistant surveyor, Wood Green Urban District Council, Royal Naval Division, Engineer Units.

Cary, F. E., assistant, borough surveyor's department, Wandsworth, 1st London Divisional R.E., Territorials.

Cook, Albert, accounts department, Featherstone Urban District Council, with the "Pals" Battalion, Lincolnshire Regiment.

Cox, W., electric light department, Ealing, 8th Battalion Middlesex Regiment, Territorial Army.

Cozens, G., electric light department, Ealing, Royal Army Medical Corps, Territorial Army.

Cullen, C. O., electric light department, Ealing, Queen's Westminster Rifles, Territorial Army.

Davey, R., electric light department, Ealing, Royal Army Medical Corps, Territorial Army.

Davis, W. J., clerk to surveyor, Finchley Urban District Council, Herts Imperial Yeomanry.

Duffield, A. E., borough surveyor's department, Ealing, 8th Battalion Middlesex Regiment, Territorial Army.

Dunman, F. W., clerk, borough surveyor's department, Wandsworth, 5th East Surrey Regiment, Territorials.

Ficklin, A. H., borough surveyor's department, Ealing, 28th London (Artists' Rifles), Territorial Army.

Furber, R., education office, Ealing, 23rd Battalion of the London Regiment, Kitchener's Army.

Garrett, R., electric light department, Ealing, H.M.S. "Macedonia," Navy.

Glenn, A. J., education office, Ealing, 5th Battalion Seaforth Highlanders, Territorial Army.

Harland, N. J., clerk to public health department, Finchley Urban District Council, 4th East Anglian R.F.A. Ammunition Column.

Higgins, Thomas, assistant, borough surveyor's department, Leicester, Royal Naval Division, Engineers' Unit.

Holmes, C. N., clerk gas department, Morecambe Town Council, 5th King's Own Royal Lancaster Regiment.

Jackson, H. V., assistant, county surveyor's office, Peterborough, corporal, 3rd Battalion, Northamptonshire Regiment, Territorials, Weymouth.

King, H. J., assistant, engineer and surveyor's department, Ruislip-Northwood Urban District Council, 9th Battalion Middlesex Teritorials.

Lewis, L. O., second assistant, surveyor's department, Weybridge Urban District Council, R.A.M.C. Field Ambulance Detachment (Territorials). Has volunteered for foreign service.

Lissaman, A. J., engineering assistant, Finchley Urban District Council, University of London O.T.C.

Lister, G., road foreman, borough surveyor's department, Wandsworth, 2nd London Divisional R.E., Territorials.

McNaught, D., borough treasurer's department, Ealing, London Rifle Brigade, Kitchener's Army.

Manser, J. W., electric light department, Ealing, Duke of Cornwall's Light Infantry, Kitchener's Army.

Melhuish, H. W., engineering assistant, Finchley Urban District Council, 1st Home Counties R.F. Artillery.

Metcalf, F., clerk in rating department, Finchley Urban District Council, G Company, Kent Cyclists' Battalion.

Mortimer, W., chief clerk, electricity department, Morecambe Town Council, 5th King's Own Royal Lancaster Regiment.

Mulliner, P. C., clerk, borough surveyor's department, Wandsworth, 7th London Brigade R.F.A., Territorials.

Palmer, H. A., sanitary inspector, Wandsworth, 1st London Sanitary Company R.A.M.C., Territorials.

Peake, A. E., divisional surveyor and inspector, Essex County Council, with the Engineering Unit of the Royal Naval Division.

Potter, J., assistant, borough surveyor's department, Wandsworth, 1st London Divisional R.E., Territorials.

Roberts, William, surveyor's clerk, Featherstone Urban District Council, with the "Pals" Battalion, Lincolnshire Regiment.

Rogerson, W. A., divisional surveyor and inspector, Essex County Council, with the Engineering Unit of the Royal Naval Division.

Smart, Vincent, assistant engineer and surveyor's department, Cheshunt Urban District Council, 5th Battalion, East Kent Regiment (The Buffs).

Smith, Harold T. M., pupil, engineer's department, Southwick-on-Sea Urban District Council, 7th Durham Light Infantry.

Smith, J. H., town clerk's office, Morecambe, Sergeant, 2nd West Lancs R.F.A.

Templeman, P. L., education office, Ealing, Royal Field Artillery, Kitchener's Army.

Voice, H. Guy, assistant surveyor, East Grinstead Urban District Council, Second Lieutenant, Royal Lancaster Regiment.

Wallingford, A. C., county surveyor, Peterborough, Lieutenant, 4th East Anglian Royal Field Artillery, Territorials.

White, R., electric light department, Ealing, Royal Army Medical Corps, Territorial Army.

Wright, H. H., advertising manager, Morecambe Town Council, 5th King's Own Royal Lancaster Regiment.

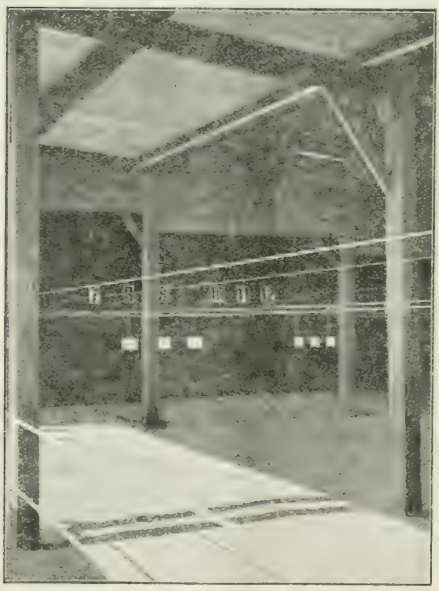
Mr. Reginald A. Dibdin, partner of Mr. W. J. Dibdin, the bacteriologist and chemist, and not, as stated in our issue of the 18th ult., Mr. L. A. Dibdin, the engineer to the Slate Bed Biological Sewage Disposal Company, Limited, has joined the 10th Battalion King's Royal Rifles (Kitchener's Army), and Mr. F. J. A. Dibdin, partner of Mr. L. A. Dibdin in the firm of Messrs. Dibdin & Dibdin, sanitary engineers, is a Lieutenant in the 3rd Battalion Royal Sussex Regiment (Regular Army).

CHISWICK RIFLE RANGE.

We [illegible] the opening of a miniature rifle range which has been constructed at the expense of the Chiswick Chamber of Commerce for the use of ratepayers of that district.

The accompanying photographic views, which we are enabled to reproduce by the courtesy of Mr. Edward Willis, ASSOC.M.INST.C.E., engineer to the district council, who acted as honorary surveyor for the work and prepared the necessary scheme, will serve to illustrate the working of the range. As we stated last week, the building, which is roofed over in order that shooting can proceed all the year round, contains twelve targets. These are movable in sets of three. Ample space is provided at the firing platform, and the range length is 25 yds. Special provision is made, by means of 2-ft grooved wheels, acting on a continuous cord attached to the target supports, for easily bringing the targets to the firing point for examination or removal. The supports are light wooden framework hung to galvanised iron wire by means of pulleys, and the whole apparatus is both simple, quick, and effective.

Chiswick Rifle Range: View of Firing Platform, showing Apparatus for Moving Targets.



View of Stop Butt, showing Moving Targets, Deflection Plates, &c.

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

The annual meeting of the above association took place at Twickenham on Saturday, the 3rd inst., when a fair number of members attended.

The following were unanimously elected as officers for the ensuing session:—

President: J. W. Croxford, engineer and surveyor, Brentford Urban District Council.

Vice-president: R. H. Jeffes, engineer and surveyor, Maldens and Coombe Urban District Council.

Hon. Secretary and Treasurer: J. G. Carey, engineer and surveyor, Heston and Isleworth Urban District Council.

Hon. Auditors: J. Webb, engineer and surveyor, Hendon Urban District Council; R. W. Hindhaugh, engineer and surveyor, Ham Urban District Council.

The retiring officers were warmly thanked for their efforts on behalf of the association during the past year. The hon. secretary presented a report of the work done, and pointed out that the association was in a very healthy condition. Several papers of a most interesting and instructive nature had been read. All of these were of a high order, and had created a good discussion. Among other matters, the question of superannuation had received much attention, and promises of support to the Bill promoted by the National Association of Local Government Officers had been obtained from several Members of Parliament.

The auditors' report showed the finances of the association to be in a satisfactory condition. The programme for the ensuing session was left in the hands of the president and hon. secretary. A discussion was opened on the question of contracts, more particularly the items referring to variations, &c.; also on pumping plant and screening of sewage.

Association of Engineers-in-Charge.—"The British Empire, and Our Work in It," is the subject of the presidential address which Mr. Frank Bailey, M.INST.C.E., will deliver before the members of this body on Wednesday, October 14th, at St. Bride's Institute, E.C. Dr. R. T. Glazebrook, the retiring president, will take the chair at 8 p.m.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions.

425. Strength of Materials.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength.

426. Geodesy.—Give a formula for computing the difference in height between two stations by means of the observed heights of the barometer, and state the meanings of the symbols used.

427. Testing Drains.—What tests should be applied to house drains before being passed? Describe any appliances used.

429. Mechanics.—A pair of blocks have three sheaves in the upper and two in the lower block. Find the pull required to raise ¼ ton, assuming [illegible] of the energy wasted.

430. Materials.—In what respects do Portland and Roman cements differ, and in what circumstances is the latter used? ("Beginner.")

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

424. Mechanics.—Distinguish between kinetic and potential energy, and show how they are measured in the case of a body falling from rest. Show that, if a body be let fall from rest, its energy remains constant till it reaches the ground.

Kinetic energy is the energy which a body possesses by virtue of its motion, and it possesses this energy until it is destroyed by the external forces (such as friction, the resistance of the air, and so on) which are always acting on it. A common example of kinetic energy is an express train travelling at a high rate of speed by reason of its momentum after steam has been shut off. The neutralisation of its kinetic energy by the forces enumerated above causes the train to come to rest.

Potential energy is the energy which a body possesses by virtue of its position, which is best described as an abnormal one. For instance, a watch-spring in uncoiling does work, and it is therefore a type of potential energy.

In the case of a body falling from rest the kinetic energy is measured as follows:—

Let a body of weight W lb. be moving at a velocity of V feet per second, and let it move through a distance of S feet before coming to rest. Let f be the retardation;

$$\text{then } V^2 = 2fS \therefore S = \frac{V^2}{2f}$$

As in Newton's Second Law of Motion, $F = \frac{Wf}{g}$

and kinetic energy = work done in [illegible] to rest

∴ Work done by a force F in moving S feet

$$\therefore F.S. = \frac{WfS}{g} = \frac{Wf}{g}\cdot\frac{V^2}{2f} = \frac{WV^2}{2g} \text{ foot lb.}$$

Now, considering potential energy, it is obvious from the principle of work that where W = weight and h = vertical distance it is raised from some standard position, work done = (Wh) ft.-lb., and that the body is capable of doing (Wh) ft.-lb. of work—*i.e.*, that its potential energy = (Wh) ft.-lb. of work.

The above arguments are perfectly clear in the case of a body falling from rest. We can now prove that in this case the sum of kinetic and potential energies is constant. Let H be the point from which the body is let fall, and O be the point at which it reaches the ground. Let the body be of weight W, and let h be its original height above the ground. At H its potential energy is the work it can do from H to O, that is, (Wh) ft.-lb. At H the body has no motion, therefore its kinetic energy is zero; so that the sum of its energies at H is (Wh) ft.-lb.

Again, at O its potential energy is zero, and its velocity is V. Therefore its kinetic energy at O is

$$\frac{WV^2}{2g} = \left(\frac{W}{2g}\,2gh\right) = (Wh) \text{ ft.-lb.}$$

so that the sum of its energies at O is (Wh) ft.-lb.

Now let P be any point where HP = x.

At P we have potential energy = W . OP = W($h-x$), and kinetic energy

$$\frac{WV_1^2}{2g} \text{ (where } V_1^2 = 2g\,\text{HP} = 2gx\text{)}.$$

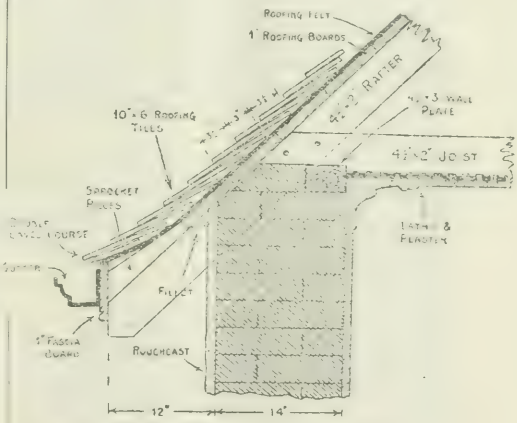
Therefore kinetic energy =

$$\frac{W}{2g}\,2gx = Wx \text{ ft.-lb.}$$

Therefore sum of energies at any point P = W($h-x$) + Wx = (Wh) ft.-lb. Hence the total energy remains constant till the body reaches the ground. (B. K., *Hayes.*)

428. Building Construction.—Draw a section through the eaves of a tiled roof, 45 deg. pitch, on a 14-in. wall. Show all details, including laths, sprockets and guttering.

The following drawing is submitted in answer to this question:—



Section through Eaves of a Tiled Roof.

Chartered Surveyors' Golfing Society.—Owing to the war, it has been decided to cancel the meetings fixed for October 7th (Croham Hurst) and October 14th (Birmingham) and also the annual dinner.—The result of the Summer Tournament is as follows: Winner, O. B. Pearse; runner-up, S. F. Monier Williams; semi-finalists, A. Goddard and M. M. Webb. The result of the Northern and Scotch Tournament is as follows: Winner, S. Addison Smith; runner-up, R. G. Kirkby. The Running Quarterly Bogey Competition for the quarter ending September 29th was won jointly by W. Jennens Hackett and R. G. Kirkby, each with a card of 4 up.—The Running Quarterly Bogey Competitions will be discontinued until further notice.—The annual general meeting will be held at the Surveyors' Institution, 12 Great George-street, S.W., on Wednesday, November 11th, at 5.30 o'clock.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Now that we are [illegible] to accept the German [illegible] to hold the next International Road Congress of Minerals, would it not be well to ask the Russian Government to give us an invitation to hold it at Berlin, or the Servian Government might ask us to hold it at Budapest? Could not the Permanent Committee also ask the Kaiser if he would be good enough, if he could spare the time, to submit to the congress a paper with some such title as "Obstructions on the Road to Paris"?

• • • •

Is it not somewhat to be regretted that there are sometimes two sides to every question? Is it not always considered that [illegible] is an excellent thing for the country? But is it a fact in connection with this that there is a certain large town in Scotland where women are very largely employed at high wages, with the result that there are more "corner men" to be seen than in almost any other town in the United Kingdom, and that these young and apparently active men are leading such happy, lazy lives that they will not enlist? What about the well-known poem which [illegible] "Men must work and women must [illegible]"?

• • • •

Is not the statement very true that it is an ill wind that blows nobody any good? Does not this apply to the manufacturers of commercial motor vehicles, who we hear are busier than ever and their shops working day and night making motor lorries and other similar vehicles for our Government? Is it not found that in modern warfare it is essential to have this class of vehicle in large numbers for the purpose of conveying food and ammunition, to the Front?

• • • •

Should not everyone read the excellent and instructive article in *Education* of the 2nd inst. on "Why Did We Go to War," by the Right Hon. Joseph A. Pease, M.P., who clearly explains the whole circumstances in a lucid and concise manner? Could anything be better than the following passage: "We are helping to the independence of Belgium against the domination of a great military Power; we stand for the freedom of nations and the sanctity of treaties against militarism and military aggression"? Could we not say after reading this article that we are fighting for an "Honourable Pease"?

• • • •

When are we likely to hear the results of the trials which have been made of the road testing machine at the National Physical Laboratory? This machine, which has now been at work for several months, was expected to solve many problems of road wear, and especially that of the cause of waves on the surface. Has it done this: and whose duty is it to publish the results?

• • • •

Is it a fact that the roads in Russia are so bad that the Czar's troops are already experiencing considerable difficulty in making their way to the Front? Would it not be a good move if an English road engineer of experience were employed by the Russian Government to proceed there at once in order to advise them as to what should be done to place these roads in a good condition and thus make them passable in the hour of need?

• • • •

When may we expect the London County Council to issue their long-promised "Reinforced Concrete Regulations"? May we not expect them to be as near perfection as possible when they are issued, for have they not been subjected to rigorous criticism and amendment by the Local Government Board and by the experts of the Concrete Institute? Is there not always some danger of cast-iron regulations with regard to new methods of construction, tending to cripple improvements and experiments in fresh directions if the rules are too rigid and without sufficient elasticity to meet such cases?

• • • •

Apropos of a point raised by an inspector at a recent Local Government Board inquiry at York with reference to the disadvantage of asking long periods for repayment of loans, was not the inspector quite right in pointing out that the longer the period the greater the cost to the ratepayers? Does not a simple calculation show that if £100 is borrowed at 4 per cent for ten years it will cost £123 5s. 10d., whereas if it is borrowed for forty years the cost will be £202 1s. 8d., and should not local authorities realize this when asking to borrow money for the longest possible period"?

INSTITUTION OF MUNICIPAL ENGINEERS.

COUNCIL MEETING.

At a meeting of the council held in London on September 30th the following applicants were recommended for admission:

To Membership: Messrs. E. T. Fox, deputy and acting surveyor, Alnwick Urban District Council; R. A. Pereira, acting district board engineer, Godavari, India; W. Gunn, shire engineer, Surat, Queensland; C. D. Hardy, shire engineer, Gilgandra, N.S.W.; R. D. Speed, shire engineer, Ararat, Victoria; St. Eloy D'Alton, shire engineer, Dimboola, Victoria; J. Sands, town engineer, Wynnum, Queensland; and T. L. Thompson, shire engineer, Harwood, and engineer, Maclean Corporation, Queensland.

To Associate-membership: Messrs. M. Wahby, King's College, Strand, W.C., and J. R. Jussawalla, executive engineer's department, Bombay Municipality.

Transfer to Membership: Mr. C. A. Trimm, chief surveyor and engineer, Co-partnership Tenants.

Transfer to Associate-membership: Mr. F. A. W. Clarke, county surveyor's office, East Suffolk.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

Elected to Studentship: Mr. F. S. Nixon, surveyor's office, Bedale Rural District Council.

New Members, &c.—From the applicants recommended for admission at the last meeting twelve members and four associate-members were elected.

Public Health Acts (Building By-laws) Amendment Bill.—The text of this Bill is being considered by the General Purposes Committee, who will report at the next meeting of the council.

Departmental Committee on Building By-laws.—This committee is prepared to receive evidence from the institution. The committee has been appointed to inquire into the working of the building by-laws, and it has been decided, as a preliminary, that the institution submit to the committee a memorandum embodying shortly its views. Members are requested therefore to let the secretary have any suggestions they may have to make as to present codes of by-laws, their working and administration, and so forth, and these suggestions will then be dealt with by a special committee of the institution that has been appointed to prepare the memorandum.

N.A.L.G.O. Battalion. — The resolution of the N.A.L.G.O. of September 9th, that a battalion be recruited from members of the National Association for service during the war, was before the council, who are of opinion that, as there are many assistants able to leave their official duties who might desire to avail themselves of the opportunity, the matter should be brought to the notice of the members of the institution.

Delegates to N.A.L.G.O.—Messrs. Latham, Pegge and Stickland were reappointed institution delegates to the National Association.

The next meeting of the council will be held in London on Wednesday, October 28th.

The annual general meeting will be held in London in November on a day to be arranged.

York Town Planning Scheme.—Mr. George L. Pepler, Local Government Board inspector, held an inquiry on Tuesday at York into the application of the corporation to prepare a town planning scheme with reference to an area situate partly within the city and partly within the rural districts of Escrick and Flaxton. The scheme comprises three different areas, 1,806 acres in Hull-road, 543 acres in the Burton Stone-lane, and 515 acres in the New Earswick suburban districts. In regard to the Flaxton rural district, the rural council have joined with York in town planning.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bradford T.C. (September 29th. Mr. M. K. North).—£2,500 and £5,000 respectively for recreation grounds at Knowles-lane, Dudley Hill, Legrams-lane and Northside-road, Lidget Green, and for bowling greens at Girlington and Eccleshill recreation grounds.—The necessary details were submitted by the corporation officials.

Clayton West U.D.C. (September 23rd. Mr. R. G. Hetherington).—£5,739 for a sewerage and sewage disposal scheme. It was stated that the council had already spent sums approaching £1,000 out of current rates on account of sewerage improvements in anticipation of and on account of the proposed scheme.

Exeter T.C. (October 5th. Mr. W. O. E. Meade-King). £4,100 for the widening and improvement of Haven-road and Water-lane.—The town clerk, Mr. H. Lloyd Parry, and the city surveyor, Mr. T. Moulding, stated that Haven-road was the only vehicular approach to the canal wharf, to the corporation electricity works, the Exeter gasworks, timber yards, a fish-curing factory, and other works, while Water-lane was the approach to various factories and the city refuse depot.

Grimsby R.D.C. (September 24th. Mr. W. O. E. Meade-King).—£4,990 for the widening and improvement of King's-road, Immingham.—The surveyor, Mr. Hobson, gave details of the proposed scheme. It was explained to the inspector that it was essential that King's-road, which was the main road from Habrough Station and Immingham to the docks should be improved. At present it was only a very narrow road, about 26 ft. to 30 ft. wide, and the proposed width was 50 ft.

Sheffield T.C. (October 1st. Mr. F. O. Stanford). £10,342, the cost of sewerage work which is to be carried out, mainly with a view to providing work for the unemployed.—It is proposed to lay an extension to Stannington, and to substitute modern sewers for the present rubble drains in Earl Marshal-road, Heeley Bank-road, Norwood-road, and Whirlowdale-road. The corporation annually spends about £25,000 in the reconstruction of rubble sewers. The substitutions now proposed are in addition to the ordinary programme. The town clerk, Mr. W. E. Hart, and the surveyor of highways, Mr. W. J. Hadfield, gave evidence. Sanction was also asked for a loan of £2,290 for the widening and improvement of part of Meadow Hall road, and £2,088 for public conveniences.

Wem R.D.C. (September 15th. Mr. R. H. Bicknell).—£3,194 for the proposed new Smithfield.—It was stated that the sum asked for could be borrowed at 4 per cent, and as the income was estimated at £160, it was calculated that there would be a profit of £37.

Willesden U.D.C. (September 24th. Mr. M. K. North).—£2,617 for works of private street improvement in Gresham, Woodheyes and Bridge roads. Evidence was submitted by Mr. O. Claude Robson, the council's engineer, and Mr. Reginald C. Graves, the deputy clerk.

APPLICATIONS FOR LOANS.

Antrim R.D.C.—£10,768 for the erection of cottages.

Armagh U.D.C.—£1,000 for the enlargement of the reservoir.

Bromley T.C.—£666 for private street works.

Burgess Hill U.D.C.—£600 for road and park improvements.

Bury T.C.—£1,000 for road improvements.

Crick R.D.C.—£1,200 for a housing scheme.

Finchley U.D.C.—£26,550 for workmen's houses.

Lancaster T.C.—£4,304 for road construction.

Leyton U.D.C.—£3,500 for a circular tank at the sewage works.

Littlehampton U.D.C.—£200 for the purchase of land for hospital extension.

Mirfield U.D.C.—£2,421 for the purposes of road improvement and depots.

Paignton U.D.C.—£700 for works of sewerage.

Pontypool U.D.C.—£4,000 for the provision of a public slaughterhouse.

Ramsgate T.C.—£526 for road widening.

Rotherham R.D.C.—£325 for water supply works.

Willesden U.D.C.—£6,799 for wood paving, £8,539 for road improvement, and £23,143 for road widening.

Worcester T.C.—£3,400 for the St. Martin's Gate improvement.

LOANS SANCTIONED.

Barry U.D.C.—£6,900 for the erection of twenty-four workmen's houses.

Bridlington T.C.—£600 for the purchase of land in the vicinity of the waterworks.

Bromley T.C.—£13,677 for wood block paving.

Cheltenham T.C.—£6,497 in respect of municipal offices.

Darlington T.C.—£24,000 for the purposes of street improvement, and £4,170 for a water-tube boiler and a cooling tower at the electricity works.

Daventry R.D.C.—£1,626 for the erection of eight houses.

Dewsbury T.C.—£9,071 for gasworks plant, and £580 for sewerage works.

Gwyrfai R.D.C.—£6,977 for workmen's dwellings.

Hinckley R.D.C.—£1,400 for water supply extension.

Ilford U.D.C.—£8,750, the amount in excess of the original estimate of £27,500 for road improvement.

Knaresborough R.D.C.—£260 for water supply works.

Spalding R.D.C.—£1,385 for the erection of workmen's houses.

Teignmouth U.D.C.—£672 for a motor fire engine.

Torquay T.C.—£850 for road improvement.

Wrexham T.C.—£3,025 for electrical plant.

FORTHCOMING INQUIRIES.

OCTOBER.	£
12.—**Hitchin.** For the erection of working class houses (Mr. C. H. Eyles)... ...	1,250
13.—**Cambridge.** For the erection of working-class houses (Mr. C. H. Eyles) ...	3,000
13.—**Darwen.** For rebuilding public baths (Major J. Stewart)	6,550
13.—**Foleshill.** For the erection of working-class houses (Mr. Courtenay Clifton).	14,250
13.—**Newbury.** For the purposes of the cattle market and a new roof to the exchange (Mr. H. R. Hooper)	2,100
13.—**Oldbury.** For hospital extension (Dr. J. E. Chapman)	—
13.—**Ryde.** For works of water supply (Mr. P. M. Crosthwaite)	5,025
13.—**Smethwick.** For hospital extension (Dr. J. E. Chapman)	—
13.—**Wigan.** For the erection of working-class houses (Mr. W. H. Collin)	27,156
14.—**Bulkington.** For the purposes of sewage disposal (Mr. R. G. Hetherington)	8,500
14.—**Middleton.** For the erection of a town hall (Mr. W. H. Collin)...	18,930
14.—**Middleton.** For the erection of working-class houses (Mr. W. H. Collin) ...	5,000
14.—**Tewkesbury.** For the erection of houses (Mr. H. A. Chapman)	1,575
14.—**Tynemouth.** For the construction of a market shed (Mr. R. H. Bicknell)	6,000
14.—**Whitley.** For road improvement (Mr. R. H. Bicknell)	2,865
14.—**Wrexham.** For the erection of houses (Mr. Courtenay Clifton)...	11,000
15.—**Bourne.** For works of water supply (Mr. A. W. Brightmore) ..	—
15.—**Chiswick.** For the purpose of sewage disposal (Major J. Stewart)	1,420
15.—**Whitwood.** For the erection of houses and laying out a recreation ground (Mr. W. H. Collin)	12,800
16.—**Ealing.** For the extension of the refuse destructor (Mr. A. W. Brightmore) ...	2,000
16.—**Sevenoaks.** For the provision of working class houses (Mr. H. S. Stewart)	5,500

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important proposed works of which particulars appear below: Buildings—Derby, £5,547; Stepney, £15,000. Housing and town planning—Liverpool. Roads and materials—Barrowford, £2,200; Lewisham, Marylebone road; Newcastle, £9,000; Wandsworth, £30,000. Water, gas and electricity—Cardiff, Glasgow. Particulars of other proposed works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Derby T.C.—A tender, at £5,547, has been accepted for additions to the free library and art gallery.

Devon C.C.—It was recently reported that the architect, Mr. Morris, was preparing alternative plans for the proposed technical school at Torquay.

Eastbourne T.C.—The Local Government Board have approved the council's tuberculosis hospital under the National Insurance Act, 1911, for the treatment of tuberculosis.

Erpingham R.D.C.—Arrangements have been completed by this council for the extension of the isolation hospital, and the matter is to be considered by the Sheringham Urban District Council, who are also concerned in the scheme.

Herne Bay U.D.C.—The tender of the Limmer Asphalte Company, at £275, has been accepted for asphalting the roof of King's Hall.

Ilfracombe U.D.C.—The council have referred to a special meeting a report of the surveyor, Mr. O. M. Prouse, on the suggested alteration of the public slaughter-house, so as to enable it to be used by all the butchers in the town. Mr. Prouse estimated the cost at £257.

Kingston (Surrey) T.C.—The tender of Messrs. Limpus & Son, at £200, has been accepted for providing and laying a removable flooring at the swimming bath.

Manchester T.C.—With regard to the Hulme Barracks site, the Parks Committee have decided to utilise the riding school as a covered playground for children, and in the centre of the square a couple of bowling greens will be laid out for the use of residents in the district. The most important scheme, however, is the proposed construction of an open-air bath 100 ft. in length.

Nottingham T.C.—The Carnegie trustees, having offered to give £15,000 to cover the cost of building, the corporation have decided to proceed with the erection of four new branch libraries and reading-rooms.

Stepney B.C.—The Finance and Parliamentary Committee have given instructions for notice to be served on the Mercers' Company of the council's intention to exercise the option of purchase of a site in Arbour-square, E., belonging to the company, upon which to erect new municipal buildings.

HOUSING AND TOWN PLANNING.

Bridlington T.C.—Tenders have been accepted, at £1,652, for the erection of workmen's houses off Quay-road.

Holsworthy U.D.C.—It has been agreed to complete the purchase for £200 of a meadow for the purpose of erecting five workmen's cottages.

Liverpool T.C.—The Housing Committee have accepted tenders for the erection of self-contained houses in Sparling-street, and tenements in Gore-street and Gordon-street, to rehouse the dispossessed in those areas. By pressing forward its rehousing schemes, the committee hope to assist men in the building trades to tide over the period of comparative unemployment.

Wrexham R.D.C.—Tenders have been provisionally accepted for the erection of twenty-two houses, at a cost of £3,945. A tender at £760 has also been accepted for the construction of the streets in connection with the scheme.

PARKS AND OPEN SPACES.

Edinburgh T.C.—It was stated recently at the meeting of the Public Parks Committee that a considerable amount of work could, in the event of unemployment, be put in hand. This would take the form of opening and laying out of new roads, improvement of cricket pitches and golf courses.

REFUSE COLLECTION AND DISPOSAL.

Hove T.C.—It has been agreed to erect additional refuse crushers on land at the Leighton-road electricity works.

Marylebone B.C.—The offer of the Western Cartage Company to extend the contract for the removal of house refuse in the borough for one year as from March 31, 1915, at the sum of £12,495, has been accepted.

ROADS AND MATERIALS.

Banffshire C.C.—The County Road Board have by resolution agreed to support the Lecht road scheme.

Barrowford U.D.C.—The council have approved the plans of the surveyor, Mr. F. Sutcliffe, for making up a number of streets, at an estimated cost of £2,200.

Bristol T.C.—The city engineer, Mr. L. S. McKenzie, has received instructions to negotiate for the purchase of property required for the widening of Stoke-road.

Burgess Hill U.D.C.—The council have agreed to the plans of the surveyor, Mr. Edwin Brown, for the widening of part of Church-road, and improvements at St. John's Park, at an estimated cost of £600.

Castlereagh R.D.C.—It is proposed to carry out tarring on the main roads at an estimated cost of £250.

Clitheroe R.D.C.—The surveyor, Mr. J. R. Taylor, has prepared a scheme for a new road to obviate the dangerous corners on the road leading from Chatburn Railway Station to Worston. The estimated cost is £900, towards which contributions of £600 are expected.

Eastbourne T.C.—Some of the roads on the proposed sites for workmen's dwellings are 20 ft. wide only, whereas the width required by the by-laws is 36 ft., and a letter was read from the Local Government Board suggesting that the by-laws should be amended so as to allow of the reduced width. The town clerk has been instructed to draft an amending by-law accordingly.

East Grinstead R.D.C.—The council have agreed to allow the London Granite Company to substitute "Penmaenmawr" for "Quenast" granite owing to the impossibility of procuring the latter from the quarries in Belgium.

Erith U.D.C.—It has been agreed to contribute £1,000 towards the scheme for the construction of the proposed new road from Erith to Dartford.

Lewisham B.C.—The following schemes prepared by the borough surveyor, Mr. E. Van Putten, have been submitted to the Road Board: Improvement, Burnt Ash-lane by borough boundary next Bromley, £2,513; improvement, Perry-hill, £2,863; Brownhill-road, wood paving, £13,689; Catford-hill, wood paving, £5,680; Sangley-road, wood paving, £5,400; Sandhurst-road, from Sangley-road to Muirkirk-road, wood paving, £411; Eltham-road and Lee Green, wood paving, £1,448; Sandhurst-road, from Muirkirk-road to Torridon-road, tar-macadam, £1,590; St. Mildred's-road, from Birch-grove to Baring-road, £666.

Marylebone B.C.—In response to a request for suggestions, it was proposed to the Road Board that the paving of a portion of Albert-road with wood might usefully be carried out, and it is understood that the board is prepared to make a grant for the cost of this work—viz., about £6,000—in the event of distress arising. The grant is conditional on the whole of the repaving work already sanctioned and included in the estimates being carried out during the present financial year.

New Forest R.D.C.—A letter has been received from the county council, in reply to one from the district council, stating that it was intended to tarmac the main road from the junction with the borough county of Southampton to Lyndhurst.

Newmarket R.D.C.—Several road improvements are to be carried out for the better movement of troops, the cost being estimated at between £8,000 and £9,000.

the Road Board will bear the whole cost of a new length of road, and contribute 75 per cent towards the cost of the other works.

Norfolk C.C.—It has been agreed to pay the contractors for 10,000 tons of granite an extra rate of 9d. per ton, Lloyd's rate for war insurance. The county surveyor, Mr. T. H. B. Heslop, stated that the granite came from two supplies, Northumberland and Guernsey.

Nottingham T.C.—Land costing £627 is to be purchased for the widening of Thorneywood-lane.

Strood R.D.C.—The surveyor, Mr. L. Randerson, has submitted proposals for widening and improving roads at various parts of the district, in the case of its becoming necessary to find work for unemployed.

Swansea T.C.—A grant has been obtained from the Road Board of nearly £7,000 towards the cost of widening Mumbles-road.

Tottenham U.D.C.—The engineer, Mr. W. H. Prescott, has submitted a report stating that the London Traffic Branch of the Board of Trade have approved the formation of a proposed new arterial road at a point midway between the gasworks and Park Station, and that until that authority have come to a final decision it is not possible for any action to be taken in connection with the proposed scheme. In any event Parliamentary powers must be obtained to form the road across the Marshes and the 25 acres on the east side of the river Lea, as these lands have been acquired for recreation purposes only.

Wandsworth B.C.—A wood paving scheme, estimated to cost £30,000, is to be carried out with the aid of a Road Board grant.

Worcester T.C.—The Streets Committee recommend the council to make considerable purchases of property for the St. Martin's Gate improvement scheme.

SEWERAGE AND SEWAGE DISPOSAL.

Bristol T.C.—The council last week agreed to the recommendation of the Sanitary Committee to construct new sewers in the Meg Thatcher's Green district, at an estimated cost of £1,660.

Clitheroe R.D.C.—The sewerage works at Wiswell have been completed satisfactorily, with a saving of nearly £100 on the contract.

Leicester T.C.—The Highways and Sewerage Committee have submitted to the council schemes of sewerage and storm-water drainage with a view to the utilisation of surplus labour through unemployment. The estimated aggregate cost of the works is about £7,200.

Worthing T.C.—An agreement has been reached with the Steyning West Rural District Council to receive the sewage of the whole of the parish of Lancing and a small portion of the parish of Findon at Cokeham.

WATER, GAS, AND ELECTRICITY.

Cardiff T.C.—The Finance Committee recommend the council to apply to the Local Government Board for permission to borrow £14,000 for the waterworks department—viz., £10,000 for mains, £3,000 for new services, and £1,000 for meters.

Glasgow T.C.—Since the rejection of the Lochs Voil and Doine water supply scheme by the House of Lords' Committee the corporation have been prospecting for other possible sources of supply. Investigations were made by the engineer (Mr. Sutherland) with Mr. E. P. Hill, consulting engineer, London, and a report was presented embodying the results of their inquiries with regard to the various sources of supply north and south of the city suggested by the opponents to the Loch Voil scheme. In the result the city council last week resolved that a Provisional Order be promoted for the utilisation of the water of the river Turk and for the conveying of the water to Loch Katrine. The river Turk, which lies to the east of the Trossachs Hotel, flows through Glenfinlas into Loch Vennacher. It is estimated that the scheme will yield an addition of 15,000,000 gallons per day to the city's supply. Calculating the increase of consumption at 1,000,000 gallons per day and taking into account a supply of 15,000,000 gallons from Loch Arklet, the water resources of the city would thus be sufficient to meet the demands of the next thirty years.

Hinckley R.D.C.—It has been decided to proceed with the Burbage water scheme, and in connection with the work the council have accepted the tender of the Stanton Ironworks Company, at £1,486, for pipes, and Messrs. Hamilton, Woods & Co., at £231, for valves and hydrants.

Hove T.C. — The General Purposes Committee recommend the corporation to carry on the electricity undertaking as a complete municipal trading concern. The undertaking was acquired from a company which has carried on the business for twenty-one years under a lease of the council.

Machynlleth U.D.C.—The Local Government Board recently wrote urging the council to augment the water supply so that a constant service might be provided, but it was decided that no action be taken.

PERSONAL.

Mr. W. A. Lavender, of Herne Bay, has been appointed temporary surveyor and inspector to the Swaffham Rural District Council.

Mr. P. B. Conway has been appointed, under the Mayo County Council, assistant county surveyor for the Belmullet and Killala rural districts.

Mr. Dennis V. Howard, of Chesham, has been appointed borough surveyor and inspector of Okehampton, at a salary of £85, rising to £100.

Mr. E. W. Vallis, an assistant surveyor to the Langport Rural District Council, has been appointed assistant surveyor to the Frome Urban District Council.

Mr. R. S. Henshaw, surveyor and water engineer to the Portland Urban District Council, has been appointed surveyor to the Wellingborough Urban District Council.

Mr. H. Heather, of the surveyor's department, Winchester Rural District Council, has been appointed assistant surveyor to the Hartley Wintney Rural District Council.

Mr. H. L. Richardson, surveyor to the Martley Rural District Council, has had his salary increased by £45 for one quarter only, to enable him to purchase a new motor cycle.

Mr. George Nicholas Yourdi, of Ditton Dene, Surbiton, resident engineer of the Elan Valley waterworks, 1893-1907, who died on September 4th, aged sixty-four, left £17,638 gross.

Mr. O. Hilton, second assistant in the surveyor's department, Watford Urban District Council, has been appointed second assistant surveyor to the Heston and Isleworth Urban District Council.

Mr. A. H. Brain, who for seven years has been deputy surveyor and sanitary inspector to the Kingswood Urban Council, has been appointed surveyor of the Hursley Rural District Council, Hants, out of 263 applicants.

Mr. Roy B. Herd, STUD.I.M. AND C.E., who was the junior assistant to the borough engineer of Newport, and who served his articles with Mr. W. J. Newton, ASSOC.M.INST.C.E., borough engineer of Accrington, has been appointed chief assistant to the borough engineer of Morley, Yorks. He will commence his new duties on the 12th inst.

Mr. Thomas Ashby, who was road foreman to the Hampton Urban District Council, but on Monday took up his new position as assistant superintendent of roads at Willesden, has been the recipient from his late confrères of a 400-day clock and a biscuit barrel bearing appropriate inscriptions. The presentation was made by Mr. S. Chambers, the Hampton surveyor, who referred to Mr. Ashby's ten years of harmonious work with all concerned with him.

Mr. E. H. Crump, surveyor and waterworks engineer to the Hinckley Urban District Council, a portrait of whom appears on another page of this issue, has held his present appointment since 1903. He was articled to Mr. Joseph Hall, then borough engineer of Cheltenham, and afterwards served for several years as assistant in his department. He subsequently became an assistant to Mr. J. S. Pickering, the latter then being borough engineer of Nuneaton. Mr. Crump is an associate-member of the Institution of Civil Engineers, a fellow of the Surveyors' Institution, and a member of the Institutions of Municipal and County Engineers, Water Engineers and Royal Sanitary Institute. At Hinckley he has carried out new sewage disposal works, public baths, new waterworks, water

schemes for the parishes of Barwell, East Shilton and Barlestone, and a few main outfall sewers, among other undertakings.

Mr. S. Evans, county surveyor of Flintshire, had some gratifying references made to himself at the meeting recently of the Flintshire County Council. Mr. Hugh Peel, as the chairman for four years of the Main Roads Committee which, under the new system of committees, now ceases to exist, spoke highly of the excellence of the work achieved by the county surveyor, and moved that he be congratulated. This was seconded by the chairman, Mr. F. J. Gamlin, who said that there had been some likelihood that Mr. Evans would go elsewhere. Speaking purely from a selfish point of view, he was pleased that Mr. Evans did not obtain the appointment for which he had been a candidate, and he hoped that the county surveyor would still remain with them for many years to come. Mr. J. E. Buckley Jones, supporting, said that the county roads were now a credit to the county council. The motion was carried unanimously.

FOR OTHER ADVERTISEMENTS

See End of Paper.

DORSET COUNTY COUNCIL

MAIN ROADS AND BRIDGES DEPARTMENT.

ASSISTANT SURVEYOR.

Wanted, a Temporary Assistant Surveyor for the South District of the County, and to act generally under the direction of the Acting County Surveyor in the work of the Department, both on the roads and in office work.

The person appointed must devote his whole time to the work, and take up his duties as soon as possible.

Salary at the rate of £150 per annum, with an allowance of 1½d. per mile for travelling and other out-of-pocket expenses, except offices, postages and stationery, which will be provided.

All applications to be made on an official Form in candidate's own handwriting, and sent in, endorsed "Assistant Surveyor," with copies of not more than three recent testimonials, not later than Saturday, 24th October, 1914.

Forms of application and further particulars may be had from the undersigned.

E. ARCHDALL FFOOKS,
Clerk of the County Council.

County Offices,
Dorchester.
October 7, 1914. (1,991)

EAST AND WEST MOLESEY URBAN DISTRICT COUNCIL.

SURVEYOR'S DEPARTMENT.

Surveyor's Temporary Assistant required to fill position of one proposing going on active service.

Salary £80 per annum.

Preference given to one holding similar position.

Apply, with full particulars of experience, &c., before the 17th, to

J. STEVENSON,
Surveyor.

Council Offices,
East Molesey, S.W.
October 7, 1914. (1,990)

METROPOLITAN BOROUGH OF GREENWICH.

TUBERCULOSIS DISPENSARY.

TO BUILDERS AND CONTRACTORS.

The Council of the Metropolitan Borough of Greenwich is prepared to receive Tenders for the Erection of a Tuberculosis Dispensary at Maze Hill, Greenwich, according to the Drawings, Specification and Conditions of Contract, which may be seen at the Office of the Architect, Mr. Alfred Roberts, F.R.I.B.A., 92 London-street, Greenwich, on and after Tuesday, 13th October instant, between the hours of 10 a.m. and 4 p.m. (on Saturday between 10 and 12). Those desirous of tendering may obtain copies of the Drawings and Specification from the Town Clerk, Town Hall, Greenwich-road, between the above-mentioned times, upon payment of a deposit of Two Guineas, which will be returned to persons sending in a *bonâ-fide* Tender.

Tenders, on the Form to be supplied, sealed up and endorsed "Tender for Dispensary," must be delivered to the Town Clerk not later than 10 a.m. on Monday, 2nd November, 1914.

Tenderers will be required to sign a declaration that they pay such wages and observe such conditions as are considered fair in their trades.

The lowest or any Tender will not necessarily be accepted.

The Council reserve the right before a Tender is accepted of requiring the Tenderer to satisfy them or their Architect as to the nature and quality of work previously carried out by him.

FRANCIS ROBINSON,
Town Clerk.

Town Hall, Greenwich, S.E.
October 8, 1914. (1,992)

MANCHESTER CORPORATION.

The Rivers Committee invite Tenders for the construction of Main Drainage Work No. 8 (4), (East Didsbury Intercepting Sewer).

Plans may be seen, and Specification, Bills of Quantities and Forms of Tender obtained, on application at the City Surveyor's Office, Town Hall, Manchester, on payment to the City Treasurer of the sum of £10 10s., which sum will, after the Corporation have come to a decision upon the Tenders received, but not before, be returned to the person submitting a *bonâ-fide* Tender.

All cheques and postal orders are to be made payable to the order of the "Corporation of Manchester."

Tenders, enclosed in the official envelope, and addressed to the Chairman of the Rivers Committee, are to be delivered at the City Surveyor's Office not later than 9.30 a.m. on Monday, October 19th, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

THOMAS HUDSON,
Town Clerk.

Town Hall,
Manchester.
October 8, 1914. (1,994)

TOTTENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Council invite Tenders for making up—

South-grove (Section 1, Part 2).
South-grove (Section 1, Part 3).

The Plans can be seen, and Forms of Tender and other particulars can be obtained, on application to Mr. W. H. Prescott, M.INST.C.E., Town Hall, Tottenham.

The sum of £5 for each road will be charged for the Quantities, which will be returned on receipt of a *bonâ-fide* Tender accompanied by the Conditions, Specification and Quantities; otherwise the deposit will be forfeited.

The contractor will be required to pay all workmen on the Council's work the recognised Trade Union rate of wages. A schedule of such wages will be inserted in the Contract, and a copy of the Schedule must be exhibited on the Pay Office at the works.

Canvassing Members of the Council is strictly prohibited, and if any Members, Agents or Representatives of Firms tendering for this work interview or canvass Members of this Council, Tenders sent in from such Firms will be immediately disqualified.

Sealed Tenders, on the Form supplied, endorsed "Tender for Making Up South-grove (Section 1, Part 2), and South-grove (Section 1, Part 3)," to be delivered to me by Twelve o'clock noon on Tuesday, 20th October, 1914.

No other form of Tender will be received.

Security will be required for the due performance of the Contract.

The Council will not be bound to accept the lowest or any Tender, and reserve the right to accept a part only of any Tender received.

(By order)
VINCENT A. BALLS,
Acting Clerk of the Council.

Tottenham.
October 7, 1914. (1,993)

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.
—MASSINGER: "The Fatal Dowry," Act ii., 2.

SANITATION AND WAR.

To the Editor of THE SURVEYOR.

SIR, The 2nd London Sanitary Company has volunteered for service abroad, and a new Home Service unit is being formed to take its place. It is desired that the new unit shall be composed of men with definite experience in some branch of sanitary work.

There are, doubtless, many among your readers who have not seen their way to volunteer for service abroad who would be glad to serve their country at home.

The need is urgent, as many hundreds of thousands of men are now encamped or billeted in various parts of the country, in many cases necessarily without any sanitary arrangements beyond what they can improvise for themselves. Under these conditions, as shown by our own experience in South Africa, and that in the United States in the Spanish-American War, devastating outbreaks of disease must sooner or later occur unless the sanitary work of the various camps is carefully and conscientiously performed. Any failure in this respect will inevitably lead to a deplorable loss of life, and may even seriously cripple the country in the life-and-death struggle in which it is now engaged.

The chief danger lies in the failure of the vast majority of the men to realise the need for sanitary precautions, coming, as most of them do, from homes where the whole of the sanitary duties are admirably discharged without effort on their part by the local sanitary authorities.

The work of a sanitary company is to supervise the sanitation of camps and billets, to report defects, and instruct the sanitary squads of the various units.

Any of your readers desiring to join the new company, or to obtain further information concerning it, should apply to Lieut. Cave or myself, at the Duke of York's Headquarters, Chelsea (close to Sloane-square Station), on any weekday between 9.30 a.m. and 6 p.m. —Yours, &c.,

ARTHUR J. MARTIN,
Captain, R.A.M.C.(T.F.)
O.C. 2nd (Home Service)
London Sanitary Company.

Duke of York's Headquarters,
Chelsea, S.W.
October 5, 1914.

INVESTMENT IN HOUSING.

To the Editor of THE SURVEYOR.

SIR, Many people are at the present time doubtful as to how they shall invest their money in view of prevailing uncertainties. The Garden Cities and Town Planning Association wishes to call attention to one method of private investment which may be of great national service.

There are at present in existence a number of schemes—such as the first garden city at Letchworth and the various garden suburbs which have been successfully started in various parts of the country—where building and development operations are now in danger of being curtailed through lack of capital, and where much work could be done if money were at once forthcoming.

As these schemes are all to meet the lack of housing, those prepared to help them would be securing three important points:—

(1) They would lessen both unemployment and the call upon relief funds.

(2) They would help to ease the pressing housing problem.

(3) They would receive a satisfactory financial return upon their money.

It should be pointed out that under recent legislation the advantage secured is far greater than the amount invested. The Local Government Board is prepared to advance to public utility societies a large proportion of the capital needed for housing purposes. If, as may well be the case, 80 per cent of the value of the property is advanced by the Local Government Board, every £1,000 of capital subscribed will mean £8,000 worth of building operations.

Information can be obtained from the offices of the Garden Cities and Town Planning Association, 3 Gray's Inn-place, London, W.C.—Yours, &c.,

In the name of the association,
(Signed)
SALISBURY, President.
CECIL HARMSWORTH, Chairman.
EWART G. CULPIN, Secretary.

October 1, 1914.

POSTPONEMENT OF MEETING.

To the Editor of THE SURVEYOR.

SIR,—I notice in your issue of September 25th an announcement of the meeting which the institute had arranged to hold at York on October 24th. This meeting has, unfortunately, owing to the present crisis, had to be postponed, but will be arranged when times are more propitious.—Yours, &c.,

E. WHITE WALLIS,
Secretary, Royal Sanitary Institute.

90 Buckingham Palace-road, S.W.
September 30, 1914.

[A short announcement with regard to the postponement of the meeting referred to appeared in our last issue.—Ed. SURVEYOR.]

MANCHESTER CLEANSING DEPARTMENT.

It is stated in the annual report of the Manchester Corporation cleansing department, which was issued on Monday, that the gross expenditure upon the work during the year (which ended on March 31st) was £213,528. The gross income was £68,367, so that the cost to the rates was £144,161. An advantage was gained during the year by the reduction in the price of provender. The average cost per horse per week for provender and bedding was 11s. 10d.

From 140,367 dwelling-houses, 4,511 lock-up shops, and 4,404 workshops there were collected and disposed of during the year 142,468 tons of ashes, 8,176 tons of other refuse, 39,689 tons of warehouse and trade refuse, 6,682 tons of slaughter-house refuse, 4,801 tons of stable manure, and 2,353 tons of fish refuse. From the city thoroughfares and markets 88,100 tons of street sweepings and 4,679 tons of market garbage were collected and disposed of. The total weight of refuse collected and disposed of by the department during the year exceeded 312,000 tons, or over 1,000 tons each working day.

The department has 27 depots and yards, 33 destructor cells, and 20 boilers used for the destruction of refuse, four private railway sidings, four estates of 3,753 acres, 608 horsed vehicles, four locomotives, 109 broad-gauge railway wagons, 254 light railway trucks and bogies, 25 miles of light railway, 10 barges and a steam tug, and a stud of 460 horses. There is a staff of 1,700 employees, involving a yearly payment of wages of £125,744. Included in the income of the department are £7,793 for rents received from farmers on the Chat Moss and Carrington estates, £4,830 for the sale of manufactured manure, and £2,891 for the sale of mortar.

Dungannon Water Scheme. The Dungannon Urban and Rural Councils have given their consent to the proposed application for a Provisional Order for the acquisition of water rights and additional lands in the Altemore catchment area, and Mr. J. H. H. Swiney, of Belfast, has been appointed engineer in charge of the scheme.

Dermatine Valves.—In 1911 some Dermatine valves were supplied to a firm of pump makers in the North of England for use in a vacuum pump manufactured by them for a sugar refinery in London. The pump has been working practically night and day ever since, except for adjustments necessary with all new machinery. The valves were taken out recently, and the engineer informs the Dermatine Company that, although the valves have been working for three years, the wear on them is very slight. They have been put back in the pump with the prospect of working for some time. The engineer is willing to give every facility for the inspection of the valves by the engineers of other firms who write asking for an appointment.

SOME RECENT PUBLICATIONS.*

HISTORY OF BRIDGE ENGINEERING. By Henry Grattan Tyrrell. Price 8s. Chicago: Published by the author.

It would obviously be impossible to write a history of bridge engineering which would fill many large volumes, and it is equally impossible to do justice to the subject in a single volume, or even in half-a-dozen volumes, if the story of bridge building is to be made readable. It is therefore important to notice the limitations of the useful work before us. There are 185 pages (size 9 by 6) of text and illustrations, the latter numbering 330, and most of them being outline or pen sketches drawn to a sufficiently large scale. Engineering details are shown to an extent quite adequate for the purpose of the book, and the author, having wisely refrained from introducing matter relating to the development of principles, or to design from principles, has produced a work which really is a history of bridge building, and not a history of bridge building and scientific principles. Different types. In his preface the author writes: "Proficiency in any art or science is not attained until its history is known. Many a student and a designer finds, after years of labor, that the problems over which he studied were considered and mastered by others years or centuries before, perhaps with better results than his own." The history of engineering is, he considers, quite as worthy of attention as is the history of architecture. In condensing his material into a volume comparing in size with other text-books, Mr. Tyrrell has selected his illustrations from a stock of over 2,000, and has been obliged to omit a large number of views of ancient and mediæval bridges. It may be noted, too, that the word "history" does not imply that modern bridges have been neglected. "A large part of the volume is necessarily devoted to comparatively recent history, as the majority of bridges have appeared since 1760, when bridge building was revived in France under the direction of Perronet." The reproduction of the illustrations is very good, and heavy type is used here and there in a manner convenient for ready reference. There is an index of thirty pages, and a separate list of illustrations. Certainly this is a book to be recommended to English readers, and it should be regarded, not only as a technical work, but also as a library book.

FERGUSSON'S PERCENTAGE TRIGONOMETRY. By J. C. Fergusson, M.INST.C.E. Price 3s. 6d. nett. London: Longmans, Green & Co.

Mr. Fergusson's monumental work on the percentage unit of angular measurement, which appeared some two years ago, was so well received by those most competent to judge of its merits that he has been encouraged to supplement it by the present inexpensive text-book adapted for "schools, colleges, surveyors, navigators, and all who have to measure lines and angles." Mr. Fergusson's discovery simplifies plane trigonometry, and practically reduces it to arithmetic by a new method of numbering angles. We reiterate our formerly expressed opinion as to the real value of the discovery, and welcome the appearance of this work, which will no doubt tend to popularise it.

BIGGAR'S CONTRACTING WORLD DIRECTORY, 1914. Edited by C. W. Biggar. Price 10s. 6d. London: R. Biggar & Co.

In the interval which has elapsed since the publication of the last issue of this directory, in March of last year, each section of the work has been carefully revised, and in particular the list of public works under construction has been brought up to date. The directory includes, among other matters, lists of architects, engineers to local authorities, railway companies and other bodies, and a comprehensive catalogue of contractors classified according to the special kind of work they undertake. The whole bears evidence of careful preparation.

The two latest reports of the British Fire Prevention Committee deal respectively with certain extinguishers constructed and put forward for test by the Great Western Railway Company, and with a test of some proprietary partitioning boards.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

ARRANGEMENTS FOR WAR SERVICE.

ACTION OF THE SURREY COUNTY COUNCIL.

The chief business of a special meeting of the council last week was to receive and consider the following report of the Finance Committee as to the salary, status and future position of the officers, staff (including teachers) and other employees of the council and its statutory committees who are serving or hereafter enlist in His Majesty's forces during the war. After careful consideration the committee recommend:

(1) That the Reservists on the staff be paid their present civil pay less service pay and allowances.

(2) That in respect of all other county officers, members of the staff, teachers, officials and other employees in the permanent service of the council, those who were Territorial members at the date of mobilisation shall receive their present civil pay in addition to their service pay and allowances, and, of others, those for the performance of whose duties such a pay or an increase can be made be encouraged to volunteer for service in any of His Majesty's forces, and such as are accepted for service shall receive their present civil pay with increments under the scale less service pay and separation allowance, if any, such deduction to be calculated from the date of expiration of any period of vacation on full pay that may be due at the date of enlistment.

(3) That the above arrangement shall commence from the date of embodiment or attestation as the case may be, and remain in force until September 30, 1915, or until the termination of the war, or discharge from service, whichever shall first happen.

(4) That all members of the staff serving in His Majesty's forces shall be reinstated without loss of civil pay or status, if convenient, in the original civil pay or status in the original posts, if convenient, or if not, in others of a similar grade.

(5) That the foregoing civil pay be subject in each case to the deduction of the whole or some portion of the premium on an insurance policy, available to September 30, 1915, for providing not more than £100, in the event of death in consequence of the war, provided that an insurance scheme be arranged with an assurance company with the approval of the Local Government Board.

Sir E. F. Coates, M.P., stated at the meeting that the cost of insurance would be from £4 to £7 for the period of the war. It was proposed that the county council should pay the premium in all cases where the employee's salary was not more than £130, and that above that sum the premium should be deducted from the salary. The Local Government Board would probably not allow the payment, but he hoped the council would take the risk of a surcharge. It was unanimously agreed to take the risk.

(6) That the committee be empowered to settle the details of a scheme for carrying out the foregoing recommendation.

In connection with the last recommendation, negotiations have been opened with certain assurance companies, and it is hoped that it will be possible to present to the council the outlines of a feasible scheme. The committee have authorised the chairman of the council, the chairman of the committee and clerk of the council to make such arrangements as may be necessary for temporarily filling the vacancies in the offices of the county council caused by the absence of those serving with the colours, and it is intended as far as possible to arrange that such vacancies will be filled by the appointment of suitable persons resident in the county who may have lost employment of a similar nature owing to the war.

The report gave rise to a very long discussion, but it was carried with a few verbal alterations.

In addition to those mentioned under the heading "Pro Patria," about forty of the outside employees of the borough surveyor's department, Wandsworth, are serving with the Army or Navy.

About thirty members of the outdoor staff of the borough surveyor's department, Ealing, in addition to the names in our Honours List, have joined the naval or military services. The council have passed a resolution that all positions shall be kept open, and that those away shall have their full salaries less the service pay they receive.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

Meetings will be held at Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

B. Wyatt,
Secretary

39, Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SANITARY INSPECTOR.—October 10th.—Fulham Borough Council. £120 per annum. Mr. J. P. Shuter, town clerk.

BURGH SURVEYOR.—October 10th.—Inverurie Town Council. £110 per annum. Mr. J. Kelbie, town clerk.

ASSISTANT SURVEYOR (Temporary).—October 10th.—Harrow-on-the-Hill Urban District Council. £2 per week.—Mr. John Strachan, clerk.

TOWN FOREMAN.—October 10th.—Willenhall Urban District Council. 35s. per week.—Mr. T. Edgar Fellows, engineer and surveyor, Town Hall.

CLERK OF WORKS.—October 12th.—Corporation of Coventry. £3 3s. per week.—Mr. J. E. Swindlehurst, city engineer and surveyor.

CLERK OF WORKS.—October 12th.—Corporation of Newport (Mon.). £3 per week.—Mr. A. A. Newman, town clerk.

SURVEYOR.—October 13th.—Holsworthy Rural District Council. £130—£150 per annum. Mr. C. Kinsman, clerk, 8 North-road, Holsworthy.

ARCHITECTURAL ASSISTANT.—October 13th.—Corporation of Exeter. £2 2s. per week. Mr. T. Moulding, city engineer and surveyor.

SURVEYOR'S ASSISTANT.—October 13th.—Ware Urban District Council. £52—£62.—Mr. G. H. Gisby, clerk.

ENGINEER AND SURVEYOR.—October 13th.—Portland Urban District Council. £200 per annum. Mr. R. A. Colenutt, clerk, Council Offices, New-road, Portland.

CHIEF SANITARY INSPECTOR.—October 16th.—Corporation of Edinburgh. £200—£400. Mr. T. Hunter, town clerk.

ENGINEERING ASSISTANT.—October 21st.—Neath Rural District Council. £90 per annum. Mr. D. M. Davies, engineer.

TEMPORARY ENGINEERING ASSISTANT.—October 22nd.—Corporation of Nottingham. £140 per annum. Mr. Arthur Brown, city engineer.

SURVEYOR'S TEMPORARY ASSISTANT.—October 23rd.—Corporation of Salisbury. £150 per annum. Mr. Francis Hoddinott, town clerk.

ARCHITECTURAL ASSISTANTS.—Public Works Department, Ceylon. £300—£350.—Messrs. Gregory, Eyles, & Waring, 12 Dean's-yard, Westminster, S.W.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

MUTFORD.—October 21st.—Specifications and estimate of cost of two semi-detached houses, for the Mutford and Lothingland Rural District Council. Plans to be unsigned.—Mr. W. B. Forward, clerk, 148 London-road, near Lowestoft.

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HINCKLEY.—October 10th.—For laying about 4 miles of water mains, erection of a workshop, and approach road, and the provision and fixing of wrought-iron fencing, for the rural district council.—Mr. E. H. Crump, engineer, Hinckley.

LANCASHIRE.—October 10th.—For the erection of a police station, for the Standing Joint Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

MANCHESTER.—October 10th.—For the erection of a school, for the corporation.—Education Offices.

CORNWALL.—October 10th.—For the erection of a new school and additions to existing school, for the Education Committee.—Mr. S. Hill, architect, Green-lane, Redruth.

KILLARNEY.—October 10th.—For the erection of twenty-seven cottages, for the rural district council. Mr. P. Carey, clerk.

WHITEFIELD.—October 12th.—For the erection of fifty-eight houses, for the urban district council.—Mr. G. M. Denton, engineer and surveyor.

WALLASEY.—October 13th.—For the erection of tramway workshops, for the corporation.—Borough Engineer and Surveyor.

WEST SUSSEX.—October 13th.—For the erection of new schools and alterations to existing schools, for the Education Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WALTHAMSTOW.—October 13th.—For the erection of boundary wall and iron fencing, for the Education Committee.—Mr. H. Prosser, architect, Education Offices.

ANNFIELD PLAIN.—October 13th.—For the erection of eight houses, for the urban district council. Mr. T. J. Trowsdale, surveyor.

PORTLAND.—October 14th.—For the construction of a public convenience, for the urban district council.—Mr. R. S. Henshaw, engineer and surveyor.

HAMMERSMITH.—October 14th.—For the erection of a urinal, for the borough council.—Mr. H. Mair, borough surveyor.

COLWYN BAY.—October 15th.—For the erection of an electric power station, for the urban district council.—Mr. E. M. Lacey, 12 Victoria-street, Westminster.

GILLINGHAM.—October 16th.—For the erection of fifteen cottages, for the corporation.—Mr. J. L. Redfern, borough surveyor.

KETTERING.—October 16th.—For alterations and additions to hospital, for the Joint Hospital Board.—Messrs. Blackwell & Riddey, 53 High-street, Kettering.

BEVERLEY.—October 17th.—For additions to lunatic asylum, for the Asylum Committee.—Mr. J. Bilson, architect, 23 Parliament-street, Hull.

LEICESTER.—October 17th.—For the supply and erection of steel plate girders and steel troughing, and the widening of Bow Bridge over the river Soar, for the corporation.—Borough Surveyor.

COSFORD.—October 17th.—For the construction of a brick tower, laying water mains, standpipes, valves, and other works, for the rural district council.—Mr. C. Dudley Bright, Polstead Heath, Polstead, Suffolk.

GODSTONE.—October 17th.—For the erection of ten working-class dwellings, for the rural district council.—Mr. T. C. Barralet, surveyor.

BLACKBURN.—October 19th.—For the erection of a fire station and firemen's dwellings, for the corporation.—Mr. W. Stirrup, 14 Richmond-terrace.

SIDMOUTH.—October 19th.—For the erection of forty-eight cottages, for the urban district council.—Mr. R. W. Sampson, architect, Manor Offices, Sidmouth.

SOUTHAMPTON.—October 20th.—For the construction of a covered reservoir, for the corporation.—

[illegible]

LONDON [illegible] For the [illegible] for the [illegible] general. Superintending Architect, County Hall, Spring-gardens, S.W.

LONDON [illegible] For the [illegible] and other works for the county council. Chief Engineer.

MANCHESTER [illegible] For the [illegible] of the Assistant Curates' Residence, for the corporation.—Messrs. G. H. Hill & Son, Albert Chambers, Albert-square, Manchester.

IPSWICH [illegible] For the [illegible] public baths, offices, for the corporation.—Mr. J. E. Moore, corporation surveyor.

MANCHESTER [illegible] For a [illegible] for the corporation. The City Architect, Town Hall.

FAVERSHAM [illegible] For [illegible] and supplying [illegible] with all necessary [illegible] and the construction of a new reservoir, for the rural district council.—Mr. H. Hovend Hope, 28 Victoria-street, Westminster, London, S.W.

OYSTERMOUTH [illegible] For the construction of [illegible] and [illegible] service reservoir and filter beds, for the urban district council.—Mr. W. P. Puddicombe, surveyor.

WEST HAM [illegible] For the [illegible] of [illegible] and Goodmayes, Essex, for the corporation. Borough Engineer, Town Hall.

ILFORD.—October 27th.—For the erection of buildings and [illegible] work, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

SWANSEA.—For the erection of 500 workmen's houses, for the corporation.—Mr. C. A. Broadhead, [illegible] Prospect-place, Swansea.

Roads.

KESTEVEN.—October 10th.—For the supply of granite, slag chippings and rejections, gravel, and tarred macadam, for the county council.—Mr. W. B. Purser, county surveyor, Grantham.

WITHERNSEA.—October 10th.—For making up a road, for the urban district council.—Mr. J. B. Kirton, engineer.

WANDSWORTH.—October 12th.—For the repair of part of Wimbledon Park-road, Mount Ephraim-lane, Gatton-road, and Idlecombe-road, for the borough council.—Mr. P. Dodd, borough engineer.

STOCKTON.—October 12th.—For making up thirty-five streets, for the corporation.—Borough Engineer.

WIGTON.—October 12th.—For maintenance of the district roads, for the rural district council.—Mr. T. B. Simmons, surveyor.

BROADSTAIRS.—October 12th.—For the supply of granite macadam, pitchers, and pea gravel, for the urban district council.—Mr. H. Hurd, surveyor.

CAERPHILLY.—October 12th.—For the supply of granite metalling and gravel, for the urban district council.—Mr. A. O. Harpur, surveyor.

MOUNTAIN ASH.—October 13th.—For improvement to footways, for the urban district council.—The Surveyor.

LONDON.—October 13th.—For paving works with creosoted deal blocks, for the county council.—Mr. G. W. Humphreys, chief engineer, Spring-gardens, S.W.

WIMBLEDON.—October 13th.—For making up two streets, for the corporation.—Borough Engineer and Surveyor.

KNARESBOROUGH.—October 13th.—For private street works, for the rural district council.—The Surveyor, 14 Bower-road, Harrogate.

ANNFIELD PLAIN.—October 13th.—For private street works, for the urban district council.—Mr. T. J. Trowsdale, surveyor.

ASHTON-UPON-MERSEY.—October 13th.—For [illegible] up streets and passages, for the urban district council.—Mr. F. Hutton, surveyor.

HAMMERSMITH.—October 14th.—For paving the [illegible] of Dallin-road, for the borough council. Mr. H. Mair, borough surveyor.

STOKE-ON-TRENT.—October 14th.—For making up certain streets, for the corporation.—Borough Surveyor.

ROCHDALE.—October 14th.—For making good part of a street, for the corporation.—Borough Surveyor.

SOUTHEND.—October 14th.—For making up a certain road and passage, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

GLAMORGAN.—October 14th.—For widening a [illegible] road, for the county council.—County Hall, Cardiff.

CHELMSFORD.—October 14th.—For private street works, for the corporation.—Mr. P. T. Harrison, borough engineer.

OLDHAM.—October 14th.—For making up certain streets, for the corporation.—Borough Surveyor.

BISHOP'S STORTFORD.—October 16th.—For the supply during the year of broken granite and granite chippings, for the urban district council.—Mr. R. S. Scott, engineer and surveyor.

HARROW.—October 17th.—For widening and surfacing, and laying out an open space, for the urban district council.—Mr. J. P. Bennetts, engineer and surveyor.

SHEERNESS.—October 20th.—For the supply of road materials, for the urban district council.—Mr. T. F. Berry, surveyor.

RAWMARSH.—October 27th.—For making up a street, for the urban district council.—Mr. J. A. Torpe, surveyor.

WORTLEY.—For road widening, for the rural district council.—Mr. F. Crawshaw, surveyor, 45 Exchange-street, Sheffield.

Sanitary.

SOUTHPORT.—October 10th.—For a supply of salt-glazed vitrified stoneware socket-jointed pipes, bends, junctions, and gullies, for the corporation.—Mr. A. E. Jackson, borough engineer and surveyor.

BARNSLEY.—October 10th—14th.—For laying sewers and alterations to sewage disposal works, for the rural district council.—Mr. H. Jackson, 39 Newhall-street, Birmingham.

TONBRIDGE.—October 12th.—For laying stoneware pipe sewer and manholes, for the rural district council.—Mr. F. Harris, engineer and surveyor.

ILFORD.—October 13th.—For the construction of clinker contact beds and incidental works, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

SALTASH.—October 12th.—For laying a 9-in. sewer, for the corporation.—Borough Surveyor.

LANARK.—October 13th—November 9th.—For the construction of a sewerage system, for the Middle Ward District Committee.—Mr. W. L. Douglas, District Offices, Hamilton.

CORK.—October 16th.—For work of sewerage, for the rural district council.—Mr. J. Cotter, clerk.

DUNMOW.—October 17th.—For surface drainage work, for the rural district council.—Mr. A. E. Floyd, clerk.

ABERGELE.—October 17th.—For the construction of a stoneware sewer, for the urban district council.—The Surveyor.

ROMFORD.—October 17th.—For the construction of surface-water sewer and street works, for the rural district council.—Mr. W. J. Grant, surveyor.

GLASGOW.—October 19th.—For the construction of pipe sewerage, for the corporation.—Office of Public Works, Town Hall, Govan.

LEEDS.—October 21st.—For the construction of three screening chambers, screening-house, three detritus pits, two mixing chambers, distribution chamber, four precipitation tanks, main gauging chamber, storm overflow culvert and outlet, 18 acres of bacteria beds, effluent channel and culverts and gauging chambers, and laying cast-iron feed mains, for the corporation.—Mr. Geo. A. Hart, sewerage engineer.

RHYMNEY.—November 3rd.—For the construction of main outfall sewer, for the Sewerage Board.—Messrs. Willcox & Raikes, 63 Temple-road, Birmingham.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. OCTOBER 16, 1914. No. 1,187.

Minutes of Proceedings.

Extraordinary Traffic: "Completion of the Contract or Work."

We made some comments recently in this column with reference to the time-limit for proceedings for extraordinary traffic fixed by the Locomotives Act, 1898, sec. 12, subsec. (1) (*b*). Our readers are, of course, familiar with the sub-section, and are aware that it fixes a general limit of twelve months from the time at which the damage has been done, with an alternative limit "where the damage is the consequence of any particular building contract or work extending over a long period" of six months after the completion of the contract or work. As pointed out in our previous remarks, the alternative does not cut down the general limit, but lets in claims which would otherwise have been barred by the latter. We dealt on the previous occasion with the question "What constitutes 'a particular building contract or work extending over a long period' within the meaning of the sub-section?"

Another question which has been the subject of controversy under the same provision is what is meant by the expression "the completion of the contract or work"? An engineering contract frequently contains a clause providing for the maintenance of the works for a specified period after their completion. Where that is the case, when does the six months within which proceedings for extraordinary traffic expenses can be commenced begin to run? In other words, must the action be started within six months from the time when the works were finished, or may it be brought within six months from the expiration of the period of maintenance? The courts have decided in favour of the former alternative (*Lancaster Rural District Council* v. *Fisher*, 1907, 2 K.B., 516)—that is to say (in the words of Lord Justice Fletcher Moulton), that "completion of the contract" means "constructional completion," and not contractual completion (*Carlisle Rural District Council* v. *Carlisle Corporation*, 1909, 2 K.B., at p. 475). This, however, still leaves open the question, what is "constructional completion"? And although this will generally be a question of fact, it may not be always easy to determine. One instance at least may be given in which the point was in dispute. A water company contracted for the construction of a watertight reservoir. The—or, rather, we should say, "a"—reservoir was completed, and water was let in by a certain date. The reservoir turned out, however, not to be watertight, and in order to comply with the contract the contractors were engaged for some three months afterwards in remedying defects. It was held by the Court of Appeal (reversing the Divisional Court) that the date of "constructional completion" was the date at which the defects were remedied, as it was only then that the thing to be constructed viz., a *watertight* reservoir was actually completed (*Reigate Rural District Council* v. *Sutton District Water Company*, 72 J.P., 301). Probably no one but the water company will be disposed to quarrel with this decision, but the distinction drawn in the Carlisle case between "constructional completion" and "contractual completion" seems to us to be a somewhat artificial one, and likely to create as many difficulties as it solves. Instances will readily occur to the reader in which maintenance may involve something very like "constructional" work. The moral for highway authorities whose roads may have suffered from extraordinary traffic extending over a lengthened period is to take care to launch their proceedings within the shortest time limit that may, under the most adverse interpretation, be applicable, even though this may involve the risk of having to bring further actions should future damage occur.

Electrolytic Sewage Disposal.

It is a good many years since the idea of utilising electric current for the treatment of sewage was first tried. After a number of experiments nothing further was heard of it for many years, but it has now again been introduced in several places. Particulars of a plant at Oklahoma City, United States, were published some time ago, and the total operating costs, including fixed charges, were given as 38s. 2d. per 1,000,000 gallons. We now learn from our esteemed contemporary *Engineering Record* that a similar installation of electrolytic sewage treatment plant has been in operation for some months this year on Long Island with considerable success, according to a report by the chemist of one of the boroughs which constitute New York City. The plant has been dealing with a daily volume of 25,000 gallons of sewage, and elaborate details are given of the chemical reactions which take place and of the degree of purification which has been obtained. Unfortunately the process involves the use of lime as well as electric current, with a consequent production of sludge, necessitating pressing and some means of disposing of the pressed cake. It is stated that the final effluent was clear and odourless, and that samples tested were found to be non-putrescible. In fact the company operating the system, which is patented, are prepared to guarantee the removal of not less than 90 per cent of total suspended matters, and not less than 99 per cent of total bacteria, and the working costs are given as about 33s. 8d. per 1,000,000 gallons. This is made up of 18s. for electricity and 15s. 8d. for about 11 cwt. of lime.

The results recorded with regard to the character of the final effluent appear to be quite satisfactory, but it is essential in all these new systems that the cost of operation shall be carefully investigated. On looking into this side of the question we find that the figures given above do not represent the whole expense. In the first place we find that the sewage was first passed through

a ⅜-in. screen. Anyone who has used screens of such small mesh will recognise that practically all the grosser solids are arrested by the screen, and so not dealt with by the process, but must be disposed of in some other way, causing considerable trouble and some expense. There is also the difficulty of keeping such a fine screen clean. Then again nothing is allowed for the cost of supervision or for sludge pressing and sludge disposal. When details are furnished of the actual total cost of the whole of the process we shall be in a position to make a proper comparison with other methods in general use at the present time. Meanwhile we are inclined to agree with the editorial comment of our contemporary that engineers will probably not receive the results of this experiment with quite as much enthusiasm as is contained in the report in question.

Both in this system of electrolytic treatment and in the recently introduced method of purification by aëration the chief factor is oxygen, and it will be interesting to see by which process the necessary amount of oxygen can be produced most economically. Incidentally, of course, in comparing the two methods, account must be taken of the respective costs of disposing of the sludge and the initial capital expenditure upon the necessary plant. Although investigations of this character may not be pursued so vigorously in the near future as in recent years, it is desirable to keep in touch with what is being done, as it is fairly certain that future improvement in connection with sewage purification will develop along one or other of the lines mentioned above.

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Housing in Yorkshire, Derbyshire, and Dudley.

Lack of proper housing accommodation is like a thrice-told tale, yet the necessity for calling attention to it is still great, though not perhaps so great as it was. This week our attention has been directed to the contents of three official reports on public health, and it is noteworthy that all of them give prominence to the subject of housing, and insist upon the importance of improving the conditions in which the people live. The medical officer of health for Derbyshire, Dr. S. Barwise, in his annual report just published, while admitting that under the Housing Acts great improvements had been effected—during the year with which the report deals 191 dwellings were closed in Derbyshire, and 2,483 with serious structural defects were repaired—at the same time leaves no room for doubt that merely the fringe, so to speak, of the difficulty has yet been touched. It is shown, for example, that in the whole county an average of 5·3 per cent of the tenements are overcrowded. The Clay Cross district is the worst, with 9·7 per cent of the population living in overcrowded conditions, and it also presents the highest death-rate—in other words cause and effect. Dr. Barwise states that the rapidly growing colliery districts are chiefly rural, and that the cottages which have been erected recently for colliers have five rooms. This is satisfactory so far as it goes, provided, of course, water supplies and sanitary conditions are adequate, but it will be none the less necessary to exercise vigilance in the inspection of the premises to prevent the overcrowding caused by tenants letting rooms to lodgers with the perverse idea that they are thereby reducing their rent.

With respect to the West Riding of Yorkshire, the medical officer of health, Dr. Kaye, garnishes his report quite liberally with such phrases as "there is plenty to be done," "active steps are needed," and "needs to be expedited," in relation to housing conditions. In some places there is "a great demand for houses," which cannot, of course, be met as "private enterprise is quite inadequate." This is, we imagine, an outstanding feature of the problem that it would be folly to ignore. In a very large number of instances houses cannot be provided by private agency under what are considered acceptable economic conditions, and the housing question must therefore of necessity become a question to be dealt with largely by the municipalities and the urban and rural authorities. The other report to which attention is called is the result of an inspection made at Dudley by an inspector of the Local Government Board. From this it is ascertained that the standard of housing accommodation for the working-classes is low. Old and dilapidated houses are found in all parts of the town, built in courts, without back space, or sufficient light and air. Of some hundreds of houses of this type which were visited nearly half, we are told, "appeared to be unfit for human habitation, while many more, though not unfit, were of the most undesirable type, and would require extensive repairs and alterations before they could be regarded as being in a state reasonably fit for human habitation." Though it may be allowed that much has been done and is being done to remove a serious stigma from our national reputation, the pace of improvement must be greatly accelerated if we are to reach, much less overtake, the point at which our housing accommodation can be regarded as adequate for the health and comfort of the population.

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Housing at Padiham.

The report which has just been issued as the result of an inquiry held at the instance of the Local Government Board into the sanitary circumstances and administration of the Padiham Urban District fully justifies the complaints in regard to housing which led to the investigation in question. Let it be said at once, however, that, with the exception of housing, the report shows that the administration of the various services in this district is very efficient. As far as the surveyor's department, of which Mr. John Gregson, ASSOC.M.INST.C.E., is the chief, is concerned, we are told that "the district has an excellent water supply; it is well sewered, and the sewage disposal works are adequate; the streets back and front are paved; the scavenging system is, for a small town, unusually efficient, and the destructor works are equal to present requirements." The report also notes the "careful and capable manner" in which the inspector of nuisances discharges his manifold duties, and the "intimate knowledge which he possesses of his district." The contemplation of all this excellence, however, awakens a sense of incongruity in comparison with the housing conditions in the district, and the inspector truly says that there is lack of proportion in the picture of a one-roomed or two-roomed dwelling, ill-constructed, damp, ill-lighted, and ill-ventilated, which is fronted by a street costing a guinea or more the foot run. These criticisms do not apply to the bulk of the housing, which may be regarded as "not unsatisfactory," but there is a considerable residuum of old property—situate chiefly in the Clay Bank and Partridge wards, much of which appears to be in a deplorable state. Of 197 houses examined in detail in these districts, at least forty-four are stated to be unfit for human habitation, while of the remainder about fifty may be regarded as "doubtful." The defects are those common to all old and neglected cottage property—dampness, dilapidation, defects of lighting and ventilation, unsatisfactory closet accommodation, and absence of larders, proper sculleries and wash-houses. Unfortunately this state of affairs is combined with a deficiency of housing accommo-

[illegible], so that it is a practical impossibility to make closing orders in many cases where they are urgently required. The situation can only be met by combining vigorous action in dealing with existing insanitary property with a bold housing policy.

* * *

Coast Sand Dunes.

The subjects of coast erosion and coast protection are so obviously important to an island community that it is remarkable that their literature is comparatively meagre. Indeed, it has been said that until the publication of Mr. Gerald Case's work on "Coast Sand Dunes, Sand Spits, and Sand Wastes,"* no book on the subject had been published in Great Britain. This is all the more surprising in the light of statistics given by the Ordnance Survey Department to the effect that in thirty-five years Great Britain has lost 6,640 acres by erosion, while 48,000 acres have been reclaimed during the same period. The question of erosion has hitherto been dealt with piecemeal by individual local authorities, and no central authority is in any way concerned with the establishment or maintenance of sea defence works. In view, however, of the very considerable changes which are constantly taking place in the coast line, a good deal may be said in favour of the adoption as a national service of adequate measures against encroachment. Similar considerations apply in the case of the control of drifting sand and the formation of dunes. The destruction that may be wrought by moving sand is greater than would appear at first sight. Thus, there are recorded cases of the burial of houses, churches, and even whole towns beneath a slowly drifting mass of sand. In one well-known instance a church was first completely submerged, and subsequently reappeared with the onward march of the moving sand dune. Much destruction of this kind can be prevented by first placing suitable obstructions so as to collect the material at desired points, and protecting the dune thus formed by vegetation. It has been said, indeed, that it is possible to convert sand wastes or useless belts of sand dunes into pine woods by a system of afforestation, while certain agricultural operations are not beyond the bounds of possibility. The whole question, like that of coast erosion, is one of great interest and importance.

* * *

Ferro-Concrete and War.

A perusal of the current number of *Ferro-Concrete* affords some interesting examples of the uses of reinforced concrete in war. For the protection of fortresses, for instance, the value of this material has been recognised by several European Powers, and in the light of recent events special interest attaches to its employment in the forts at Liége and Namur. Again, in the mountains of South Tyrol masked fortresses to command the passes are said to have been constructed by the Austrians, the guns being hidden by sliding doors of ferro-concrete of the same colour as the mountain sides. At Namur the twelve forts are arranged in a circle at a distance of about 6 miles from the centre of the city. Triangular in plan, they are strongly built in ferro-concrete, and have revolving and disappearing turrets. The approach to them is protected by a smooth and slippery glacis, which can only be traversed with great difficulty, and is commanded by the cross fire of the defenders. Owing to the strategic importance of the city at the confluence of the Sambre and the Meuse, Namur has been fortified for many centuries, and is now a link in the chain of fortifications along the valley of the Meuse. The river Sambre, separating the citadel from the city, is crossed by several stone bridges and by a footbridge of 170 ft. span by 10 ft. wide constructed for the Belgian Government in Hennebique ferro-concrete. The peculiar shock-absorbing power of ferro-concrete renders it specially suitable for use in the construction of defensive works—a matter which will, no doubt, receive increasing recognition by the naval and military authorities.

* * *

Sanitation and War.

In our correspondence columns last week there appeared a letter from Captain Arthur J. Martin, M.INST.C.E., announcing the formation of a new Home Service Unit to take the place of the 2nd London Sanitary Company, which has volunteered for service abroad. The duty of a sanitary company is to supervise the sanitation of camps and billets, to report defects, and instruct the sanitary squads of the various units, and it will be remembered that in drawing attention to Captain Martin's letter we pointed to the valuable experience which those engaged in sanitary work would be likely to gain by volunteering their services. This is evidently recognised by Mr. Horace Boot, the president of the Institution of Municipal Engineers, who has lost no time in bringing the matter to the notice of the members of that body. A special circular letter—a copy of which is before us—has been addressed from the offices of the institution to every member and student, and all desiring to join are recommended to communicate either with Mr. Boot or to apply direct to Captain Martin at the Duke of York's Headquarters, Chelsea, S.W. The appeal, we are sure, will not be lost on those to whom it is made, and should be instrumental in getting together the new company without loss of valuable time.

* * *

A Practical Point.

We have received from a correspondent in British Columbia, who is well qualified to speak on the subject, a letter in which he comments upon the high rate of exchange now in operation between Canada and Great Britain. The matter, perhaps, hardly comes within the legitimate sphere of a journal such as this, nor can we pretend to speak as experts with regard to it. Bearing in mind, however, the efforts which are being made at the present time to induce the Colonies to use British goods, the question of the rate of exchange is evidently important. Our correspondent points out that at the present rate it is impossible for the agents of British firms to quote satisfactory prices for goods to be delivered in Canada, and we feel that in asking us to give publicity to the matter he is endeavouring to call public attention to an important question. We therefore have much pleasure in complying with his request.

* * *

Vandalism in Belgium.

The ground covered by the members of the Society of Architects during a visit to Belgium in 1891, when they were received by the then King of the Belgians, Leopold II., is now the scene of so much architectural devastation that peculiar interest attaches to a meeting of the society which is to be held at 28 Bedford-square, W.C., on October 22nd. Mr. G. A. T. Middleton, A.R.I.B.A., the organiser of the tour in 1891, will exhibit lantern slides of the principal buildings then visited, and some others showing the devastation caused by the German bombardment. The lecture is free to members and friends introduced by them, and a few invitations are available, so far as the accommodation will permit, for others who may be interested. Written application for these must be made to the secretary.

*St. Bride's Press, Limited, 23, Bride-lane, E.C. Price 5s.

Longtown Bridge, Cumberland.

FERRO-CONCRETE REPLACES CAST-IRON.

A ferro-concrete bridge is being built at the Highway Cross, Longtown, to designs prepared by Messrs. L. G. Mouchel & Partners in association with the Cumberland county surveyor, Mr. William Finch, county surveyor of Cumberland.

The old cast-iron bridge at Longtown is rather an interesting structure, having been designed by Telford and built in the year 1820. It is said that the bridge was originally intended for another place, and that when erected at Longtown the spans were transposed, giving the bridge a peculiar undulating road surface. The gradients from the southern end—at the right-hand of the view—are, first, 1 in 14 up, followed by 1 in 18 down; then 1 in 20 down, 1 in 40 up, and finally 1 in 20 down.

In 1911 the late county surveyor and bridge engineer of Cumberland reported that the bridge was unfit for modern traffic, and the structure was then closed to traction engines and other heavy vehicles. In 1912 plans and estimates were prepared by the present county surveyor, Mr. William Finch, and submitted to the Highways and Bridges Committee. Three schemes were considered, one for a masonry bridge, one for a steel-girder bridge, and one for a ferro-concrete structure, the result being that the last was finally adopted.

The site chosen for the new bridge (states an article in the October issue of *Ferro-Concrete*) is near the old structure, the scheme providing for a slight diversion of the main road with the object of improving the approaches. The new bridge consists of three arch-spans, with two short girder spans in the north approach. The central arch span is 175 ft. from centre to centre of piers, giving a clear span of 165 ft. The two shore spans are each of 147 ft. 6 in. to centres of piers, or 138 ft. 6 in. clear. The central arch has a rise of 8 ft., that of the two outer arches being a little less.

The normal rise of tide at the site is about 5 ft., and the arches are designed so that at the springing

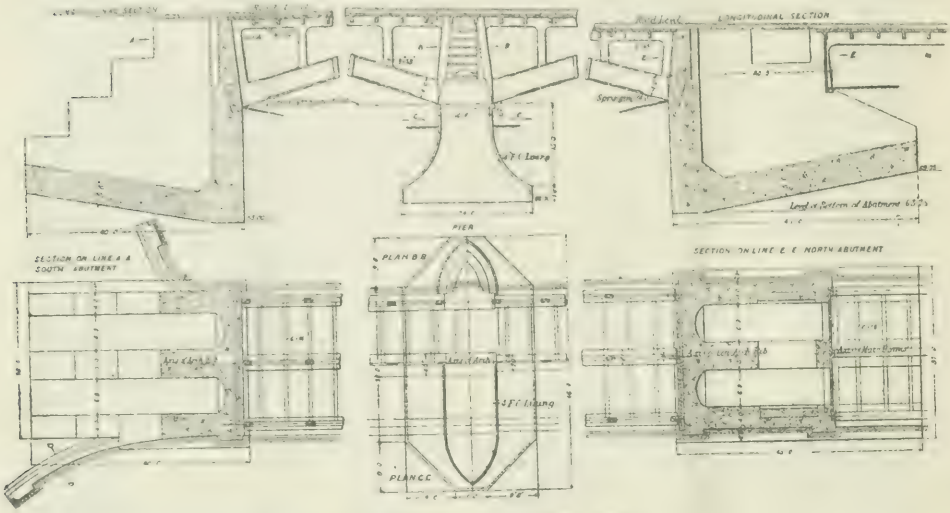


Fig. 1.—Details of Abutments and Pier.

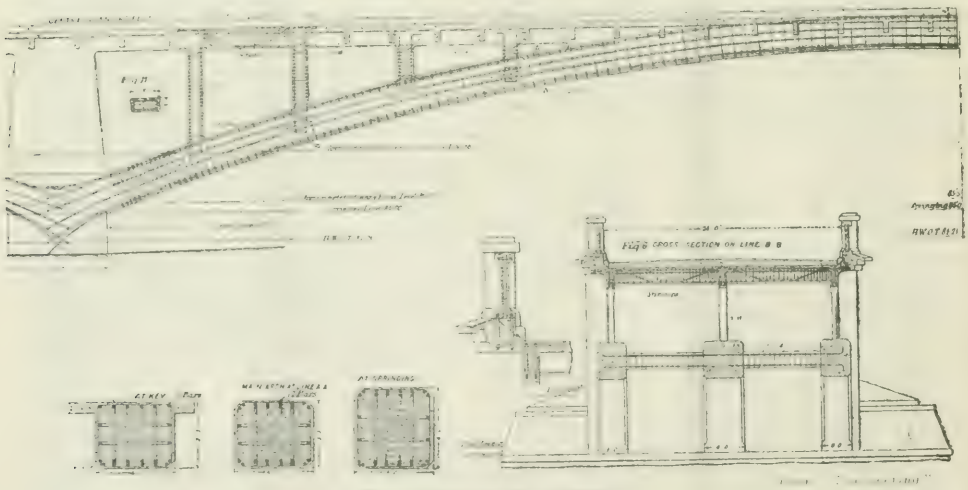


Fig. 2.—Details of Arch Construction.

Longtown Bridge, Cumberland.

they are about 17 in. above high water of ordinary tides. In general design the new bridge is plain, but of graceful lines. The only ornamentation is in the chamfering of the edges of the piers and other structural members, and in the architectural treatment of the balustrades and piers.

Fig. 1 includes a selection of details illustrating the construction of the abutments and piers. The abutments are mortared, and L-shape, consisting of vertical concrete walls, 5 ft. 6 in. thick, facing the river with floors of similar thickness extending back to a slope of 1 in 6 for a distance of 40 ft. in the south abutment, as shown by the longitudinal section and section on line AA at the left hand of Fig. 1, and 45 ft. in the north abutment, as represented in the two corresponding sections in the right hand of the same illustration.

The difference in the length of the two abutments is due to the two approach spans at the northern end of the bridge. The full width of the abutment floors is 31 ft., the bearing area having been calculated for a pressure not exceeding [illegible] tons per square foot in the south.

Extending back from the vertical wall to the floor of each abutment are three concrete counterforts, the middle one 5 ft. thick, and those on either side 4 ft. thick. The south abutment is filled in with earth to road level. At the same end of the bridge the balustrades run out into [illegible] wing walls, as shown in Fig. 1, and ending in posts similar in design to the capping of the piers. The north abutment is filled in to ground level, and a 4-in. wall, rising from the ground to the underside of the decking of one of the approach spans, encloses the space above, as shown. At this end of the bridge the balustrade is continued over the approach spans on a slight curve, and beyond them ending in short posts similar to those at the southern end.

It will be noted from the two drawings in the middle of Fig. 1 that the river piers are supported on concrete foundations having bases 24 ft. wide by 46 ft. long in the direction of the stream. These bases rest on rock, the design providing for the full size being maintained for a height of about 3 ft. above the rock level, after which the width is gradually reduced to the pier width of 10 ft. The length is approximately maintained to the springing, for, though the piers are not actually of this length, the difference is made up by cutwaters on the upstream and downstream sides. The bases for the piers are of mass concrete of the proportions of 1:6, and have a 4-in. fine cement facing all over, ending at the top just below the springing in a coping 12 in. deep.

In each of the river spans the three arch ribs are of rectangular section, above each rib, and connected to it by spandrel columns, being a longitudinal main beam. The latter carry secondary beams, and the entire series of beams is connected by the decking, the whole being in monolithic connection. The arch ribs merge into the longitudinal beams and decking in the neighbourhood of the crown. Fig. 2 shows the middle rib of the central span, with the verticals and decking, in section. The rib of this span has a section of 4 ft. by 4 ft. at the springing, as shown, diminishing to 4 ft. by 3 ft. 3 in. some distance up, and finally measuring 3 ft. 3 in. deep at the key, inclusive of the decking. The two side ribs are of the same vertical dimensions, but have a width of 3 ft. throughout instead of 4 ft. The ribs are reinforced over the greater part of the span by twenty-four round bars distributed near the top and bottom surfaces, with two extra bars equally spaced on each side. As the ribs merge into the beams and decking, the upper twelve bars are reduced in number to six. The verticals between the ribs and beams measure 9 in. by 18 in., and are reinforced with four bars. The bracing between the ribs is 15 in. by 18 in. in cross-section, and is reinforced with four bars, as shown in the cross-section on line BB. There are four braces to each span. The two end spans of 138 ft. 6 in. are similar in design to the central arch, except that the width of the central rib is 3 ft. throughout, and that of the side ribs is 2 ft. 3 in. Their depth ranges from 4 ft. at the springing to 3 ft. 3 in. inclusive at the crown. The reinforcement is similar to that of the central span, except that at the centre the number of the upper bars is reduced to four. The verticals and bracing are identical with those already described.

The main beams are 9 in. wide by 18 in. deep throughout the length of the bridge. Extending between them and spaced at 4 ft. 6 in. apart, centre to centre, are secondary beams 6 in. wide by 14 in. deep. Above is decking 6½ in. thick, over which is laid road material to a depth of 9 in. at the crown. The reinforcement of the main beams consists of six bars, two of which are near the bottom and two at the top. The remaining two are bent up over the supports, as usual in Mouchel-Hennebique practice, but between the supports they run near the bottom. The secondary beams are similarly reinforced, but with only one straight bar near the top and bottom, and one bent bar near the top at the main beams and at the bottom between them. The small spans of the north approach have longitudinal and secondary beams, and decking similar to the main spans. The balustrade shown in section in Fig 3 is 4 in. thick, pierced with cross-shaped apertures. The top rail is 12 in. wide by 6 in. deep, and is reinforced with two bars.

ASHPIT CLEANSING AT BRADFORD.

COSTLY "DAY WORK."

Owing to the large number of wet ashpits that have been converted into water-closets, with dry ashpits or dustbins attached, it has been decided to alter the period of cleansing in those districts of Bradford where the work is done by contract from eight weeks to four weeks. In a large number of cases one small dry ashpit has to serve several houses, and even one side of a street. Very frequent collections are necessary in these cases. The capacity for storage in connection with the old type of ashpit would last the required time, but in some places the new ashpits require weekly visits.

The new system of "day work" was in vogue during the whole of last year, and the results, we gather from the annual report of the superintendent of the cleansing and destructors department, Mr. Ernest Call, have been far from satisfactory from a financial point of view. Several exhaustive reports, showing the comparative costs of working the "day" and "piece" systems, have been prepared by the city treasurer, in conjunction with Mr. Call's department, and from these it has been ascertained that the "day work" system has cost, in ten months, £2,755 more than what was paid for similar work during the corresponding period of the previous year. Further than this, it has also shown a decrease of 2,920 tons in the weight of refuse removed, and an average weight of 2½ cwts. less per load. A larger staff of workmen and horses has also been required, the average increase during this period being eleven horses and fourteen men.

Following an application from the men's union for an increase of wages, the whole question was again thoroughly gone into, and several joint meetings were held between the Cleansing Committee, representatives from the men, and the trades union officials. It was eventually decided to change back to the "piece-work" system, all night work, until such times as the nature of the work permitted it to be done during the day-time.

British Fire Prevention Committee and the War.—The British Fire Prevention Committee is still short of fire surveyors (architects, surveyors or insurance officers) for occasional fire survey in the South of England, Home Counties and East Coast, and will be glad to receive applications, which should be addressed to 8 Waterloo-place, London, S.W. The committee have issued their hospital fire "Warning," No. 10, and copies may be obtained gratuitously by any hospital or convalescent home doing emergency work, or by any professional man in charge of hospital alterations or temporary buildings.

Farmers and Tarred Roads. — Last week, at Northallerton Police Court, Mr. Charles Thompson applied to the Bench for assistance in protecting the public against what he described as the "terrorism" which prevailed in the district in consequence of the condition of the main and certain district roads in the North Riding. He stated that from the Osmotherley and other adjacent townships farmers were absolutely afraid to use the "tarred" roads. Several serious accidents had occurred, and horses were almost frightened to death when on these dangerous roads. Northallerton market also suffered, as farmers were unable to get the produce down. Further stretches of roads were now being "tarred," and farmers would like this to be stopped if possible. The chairman (Mr. W. Brown) stated that the rural council had entered a strong protest with the county council. The Bench were powerless to act in the matter.

By-Laws and the Housing Question.*

By W. H. A. COURT, [illegible], Borough Engineer's Department, Leicester.

The question of the housing of the working classes is one which has attracted some importance for many years, and, in view of current events, seems destined to hold a prominent place among the problems of the day.

Into a number of the reasons advanced for the cessation of private enterprise in the provision of dwellings for the working classes the author does not propose to enter for various reasons. One must be mentioned, however, this is the difficulty which appears to be experienced by speculative builders (the word "speculative" is used here in a good sense as meaning "builders of a new kind to give authentic return for their outlay"). This difficulty is partly attributed by builders and architects alike, to unnecessary stringency in the model by-laws and the local by-laws, which are, of course, based upon them, with, in most cases, considerable amplification.

With regard to the criticisms of the by-laws raised by architects of eminence and great repute, one point has always appeared to the author to stand out. This point is that they appear to overlook the fact that the by-laws have been framed with the object of endeavouring to meet all cases, and not for the ideal conditions with which these architects, because of their situation, have to deal. The author hopes to demonstrate his meaning more clearly in dealing with a few actual instances which have been cited in these charges against the working of the model by-laws in particular, and possibly one or two in force in the particular district in which the author is engaged.

To get at a reason for the excessive cost of cottage building, and the extent of the culpability of the by-laws in this direction, the author proposes to consider the cost under three heads—viz.:—

(1) The cost of the site.
(2) The cost of the building proper, and
(3) The cost of making the roads in which the building is situated.

With regard to the first—namely, the cost of the site—this may be dismissed at once, as the by-laws will have no influence on the matter.

The cost of the building itself has now to be considered.

In a paper read before the Royal Sanitary Institute by Mr. H. B. Searles-Wood, F.R.I.B.A., and published in the Journal of that institute in October, 1913, "The Architect's Grievance against the Model By-laws" is rather fully set out. The author of that paper quoted from a number of other papers read before other societies with the same object in view. The deposit of drawings, &c., for the approval of the local authority is one of the points mentioned, and the interpretation put upon the by-laws by the officials in their inspection of these plans. In this connection the issue is somewhat obscured by the claim that all artistic effect is suppressed, or at any rate that the tendency is in that direction. To remedy the repressing effects of the over-zealous building inspector, a Court of Appeal is proposed, by which it is hoped to obtain precedents for future cases to be fought out, and to render "elastic" the present cast-iron regulations. The difficulty of carrying out by-laws as they stand is already a sufficiently onerous task; if they were to be increased in the way suggested, it appears to the author to render the office of the surveyor and building inspector untenable. The cost of the building would not, at any rate, be reduced.

One great stumbling-block appears to be the minimum

HEIGHT OF ROOMS.

This was not contained in the original by-laws, and was added in 1891.

It has been proposed to reduce the height of rooms to 7 ft. 6 in. This appears to be the lowest limit generally reached. Such a reduction would certainly save, on the ground floor, 1 ft. of brickwork, and on the first floor a similar amount. This would be, without doubt, a considerable saving in the cost of construction; but surely it would not be wise at this time to suggest that the cost of a building should be reduced at the expense of the health of its inhabitants. This point was raised at the meeting of the East Midland District held at Newark in February, 1912. The case of a farm labourer's cottage was mentioned, in which the bedroom was about 6 ft. high, and held the man and all his family. After a wet day in the open, a big fire in the evening with all the occupiers of the family present and the windows closed, the state of the air in the upper part of the room, at about the breathing level, can be more elegantly left to the imagination than to description.

The usual reply to this is that the workers must be educated to the beneficial results of fresh air and ventilation. It would appear to be safer to educate them to this idea in comparatively lofty rooms rather than to provide the lower level to the ceiling and to educate them afterwards.

The same arguments apply to bedrooms, but with added force. Space would undoubtedly be saved (and with it cost) were rooms in the roof not subjected to these restrictions. But here dormer windows are unavoidable, and consequently light must be, to a greater or less extent, kept out of such rooms, and with the light the beneficial effects of direct sunlight, well known to have great germ-destroying powers. Ventilation of such rooms would also be much more difficult. Further, the low portions of the rooms round the walls, being more difficult of access, could not be so easily kept clean. This may not be of such importance in the large houses in suburban districts (which are the houses probably in the minds of the architects in question), but in houses of the class under discussion, the author's own idea is that they should be so designed as to give every opportunity for being cleansed in the easiest possible manner, and that plenty of light should be accessible to every part of the room.

Reference may also be made at this point to the height of windows, though this will have small effect on the cost of the building. In the Leicester local by-laws it is required that at least one window in each room shall extend to a height of not less than 7 ft. 6 in. above the floor, and that the upper half at least shall be made to open. This seems a very reasonable requirement, and ensures that rooms can be ventilated above the heads of the occupants; whereas, were the windows lower—at, say, 6 ft. from the floor—the incoming air would create a draught at the level of the head.

It must also be noted that these by-laws are for the regulation of the builders, to ensure that they provide the means of thorough ventilation. It would be useless to educate the inhabitants in the advantages of fresh air and cleanliness were they compelled, owing to scarcity of houses, to live in dwellings where they would be unable to enjoy these advantages.

Another means which has been proposed for effecting the ventilation of rooms is by constructing a flue, with branches for each room, by the side of the chimney flue, and carried up above the roof with it. This would undoubtedly be extremely useful for the purpose, and the ventilation of the apartments would not be so dependent upon the opening of the windows by the occupants. On the other hand, the extra cost would take up the saving effected by reducing the height of the rooms. Consequently the gain appears to be nil.

To the author's mind the direction in which economies may be looked for in the future will be found in careful planning (leaving the artistic elevations to follow the plan), and in the use of cheaper materials of construction in the minimum quantities.

Provision is made for this in the new Model By-laws (Series IV., draft form), by which (sec. 25, subsec. *b*) concrete, plain or reinforced, may be used "of such thickness as shall be necessary to secure due stability."

The third item in the summary of expense—namely, the

STREET MAKING

—must now be considered. Possibly it is in this item that the greatest initial saving may be effected. It is also in this direction that the greatest variation in the requirements of different districts may be found. It is therefore only proposed here to deal with the by-laws of the borough of Leicester. Here there are two standard types of streets—namely, the 40-ft. roadway paved with granite setts and the 50-ft. roadway

* Paper read at the recent district meeting of the Institution of Municipal and County Engineers at Hinckley.

with water-bound or tar macadam carriageways. In each type the footpaths are laid with concrete slabs. These roads, and especially the first-mentioned and much more numerous kind, are certainly expensive to construct. It has been claimed that "over two-thirds of the cost of cottage building sites is" taken up by "these superior streets." There is another side to this, however, and that is the low cost of maintenance, repair and cleansing. Were a large number of streets of less enduring description to be thrown upon the hands of the corporation to maintain and repair, a very large increase in the annual cost of highway repair would ensue. This would result in an increase in the local rates, and would naturally tend to produce that overcrowding which it is the object, by providing increased accommodation, to prevent.

A number of extremely clever and ingenious proposals have been made to cheapen these streets, and one should be mentioned in particular. Starting from the proposition that repair is necessary in order to replace wear, the next step, evidently, was to find means to prevent wear. This was accomplished by having only a limited number of "through" streets, the remainder only being accessible to wheeled vehicles for half the length from each end, a set of posts or a small clump of trees being placed in the middle of the length to stop through traffic. This would undoubtedly be efficacious in preventing excessive wear, and would allow of less enduring construction. The author is not so sure of the moral effect on a carter with, say, a big load of coal, who might arrive into one of these "blind" streets by mistake. There probably would be further difficulties in the case of fire.

The author is of opinion that this paper will be considered to consist chiefly of destructive criticism. Any discussion will, he hopes, bring forward something constructive, however.

In conclusion, he apologises for the scattered nature of these few notes, which has been due to want of time owing to pressure of business.

SHEFFIELD CITY ENGINEER'S POSITION.

Proposals of a Special Committee for the rearrangement of the city engineer's department were adopted by the Sheffield City Council on Wednesday, and as a result Mr. C. F. Wike, M.INST.C.E., will be relieved of the responsible position which he has filled for the past twenty-five years, and take up duties of a less arduous character. His present salary will continue until June 30, 1915, after which, for a period of seven years his remuneration will be £500 a year. Mr. Wike will be styled city engineer, and he will be at liberty to engage in outside work. There will in future be a city surveyor in the person of Mr. W. J. Hadfield, the present surveyor and deputy city surveyor of highways, but until the final rearrangement of the department this appointment, like several others agreed to by the council, is to be regarded as temporary.

It should be noted that the Special Committee were not unanimous in making their recommendations. A minority report which was prepared, though not printed in the minutes, complains that no reason is given for the steps taken. This report goes on to say that there seems to be no reason why Mr. Wike, hale and vigorous, and with intellectual powers as keen as ever, should be removed from his present duties. It was felt to be a shabby way of treating an old and valued official, whose sterling integrity and intelligent devotion to the interests of the city had saved it so much money, and who had seen to the execution of so much public work which had been appreciated and admired over the whole country—it might even be said the whole world.

At Wednesday's meeting of the city council Alderman Wardley, in moving an amendment that the report be referred back for further consideration, said that underlying the attempt to shelve Mr. Wike there must be some ulterior motive.

Alderman H. P. Marsh paid a warm tribute to the work of Mr. Wike, but thought in his own interests the committee's report should be accepted.

Mr. W. Appleyard described the report as the baldest and most cold-blooded that had ever been presented to the council

Following some further remarks the amendment was lost, 15 voting in favour, 30 against, and 4 remaining neutral.

THE WAR.

WORK OF THE L.C.C. EMERGENCY COMMITTEE.

The Emergency Committee appointed by the London County Council to deal with any special matters arising in consequence of the war have issued a statement regarding their work since their constitution on August 11th.

In order to facilitate the progress of works of construction and thus to continue employment, the committee, with the concurrence of the Finance Committee, approved special arrangements with regard to payments to contractors, tenders accepted by the council but not completed as contracts before the commencement of the war, the responsibility of tenderers for future building operations, as regards rises in the price of materials, and current jobbing works contracts. They have taken steps to secure that overtime on works executed by or for the council shall be reduced to a minimum, and have received periodical reports as to overtime on such works. One of their first actions was to consider as to works which could be put in hand with the object of providing additional and useful employment, in contrast to what are known as "relief works," and in all departments work is being carried out with this object in view.

Apart from the provision of work itself, the committee have kept observation on the general conditions of employment in London, and from time to time have made representations in various quarters, with, they believe, useful effect. They have dealt with applications for the use, for His Majesty's services, of property belonging to the council, and have met to the full all requests put forward by the War Office and the Admiralty for assistance to meet the exigencies of the situation.

Arrangements have been made for the attendance of staff throughout every day and night in the office of the department of the clerk of the council, so that no delay shall occur in dealing with urgent business arising.

Messrs. Hughes & Stirling, having asked the Teddington Urban District Council if the council would be prepared to give any cover in the event of heavy rises in the prices of labour or materials in consequence of the war, have been asked to supply particulars of materials that have so risen.

The officers and men of the Thames Conservancy Board serving with the colours include thirteen from the head office, twenty-four from the navigation staff, and thirty-three from the outdoor works department. During service the full amounts of salaries and wages are being paid, less any pay received from the Government.

The whole of the indoor staff of the engineer and surveyor's department of the Wood Green Urban District Council have now undertaken special duties in connection with the war. Three members (whose names are given in our Honours List) have already enlisted for service at the Front, six others have joined the National Volunteer Reserve, and the rest, who are not fitted for military service, are acting as officials of the local branch of the Prince of Wales' Fund.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.
—MASSINGER: "The Fatal Dowry," Act ii., 2.

MUNICIPAL ENGINEERS AND THE WAR.

To the Editor of THE SURVEYOR.

SIR,—May I appeal through your columns to the municipal engineers holding appointments in India and the various Dependencies on behalf of those younger engineers who, having volunteered for foreign service in various branches of His Majesty's Forces, are anxious (when military duties permit) to increase their knowledge on professional matters by inspecting engineering works?

The surveyors whose assistants are among these volunteers might greatly assist them with open letters of introduction, containing particulars of their municipal appointments and military description.—Yours, &c.,

G. BERTRAM HARTLEY.

Town Hall,
Alton, Hants.
October 12, 1914.

Institution of Municipal and County Engineers.

EAST MIDLAND DISTRICT MEETING AT HINCKLEY.

(Conclusion.)

Considerations of space prevented our reproducing more than a portion of the paper read by Mr. E. H. Crump at the recent East Midland District meeting of the Institution of Municipal and County Engineers at Hinckley. The concluding instalment, together with a report of the discussion which followed the presentation of the paper, is appended.

ELEVEN YEARS' MUNICIPAL WORK AT HINCKLEY.

By E. H. Crump, assoc.m.inst.c.e.,

Engineer and Surveyor to the Urban District Council.

The sewage of Hinckley is one of the most difficult to treat, as will be seen from the sample analysis given below, on account of the chemicals, &c., used in connection with the dye works and dry cleaning works in the town and district.

It is well known that the colour of a final effluent does not materially affect it, provided the oxygen absorbed, the albuminoid ammonia, &c., are of a fair standard of purity, yet it cannot be denied that if a coloured effluent is discharged into a brook in which there is scarcely any water running during any part of the year, the surveyor or manager in charge of the works would have anything but a peaceful time from the farmers and other owners lower down the brook, and consequently complications would be incessantly arising.

Another great difficulty now encountered is the furring up of the pumping mains, ejectors, &c., by the lime used in connection with the works, where pipes of a diameter of 8 in. have been reduced to 5 in., and pipes of smaller dimensions have been completely blocked, and in consequence of this a new 15-in. pumping main is about to be installed

Sample Analysis of the Hinckley Crude Sewage.

Date of analysis.	Free and saline ammonia.	Organic ammonia.	Chlorine in chlorides.	Nitrogen in nitrates and nitrites.	Oxygen absorbed in 4 hours at 80° Fahrenheit.	Total solid matter.	Suspended matter.
Jan. 29, 1914.	5·05	2·00	16·5	0.00	16·6	228	52

Analysts.—Messrs. Bostock Hill and Rigby, Birmingham.
Remarks. The sample was foul, reddish brown, and turbid.
Results of Analysis expressed in parts per 100,000.

The proportion of dye, &c., waste received is slightly over one-third of the total of the dry-weather flow.

The quality of the final effluent is not satisfactory, as the amount of oxygen absorbed is very high, of course, due to the chemicals, &c., in the crude sewage, and which are not removed by double land filtration.

In addition, the land is of an unsatisfactory nature, the substrata being clay; consequently the underdrains have had to be laid at a depth of 2 ft. 6 in. to 3 ft. 6 in. only, and in several parts of the farm the ground is sewage sick, and consequently unable to be utilised. The council and the author, in conjunction with the county medical officer of health, have for the past seven years been doing their utmost to relieve the existing unsatisfactory condition of affairs, and additional settling tanks have been constructed, the whole of the farm has been underdrained, an additional pumping plant provided, the system of blowing up or clarifying the sewage installed, new pumping mains laid down, and various other improvements made, but with no effectual remedy in the actual purification of the sewage. Another experiment that was tried was the double filtration through the land.

At the present time experiments are now being conducted, by means of percolating beds, to ascertain the effect of this system on the sewage. One bed, 21 ft. in diameter and 5 ft. 6 in. deep, has been filled with broken granite of varying sizes and fitted with a revolving sprinkler, has been at work now about twelve months, and from the knowledge gained up to the present it tends to show that this method, with certain improvements, will have the desired effect of producing a satisfactory effluent. The difficulty in this method, however, is with the lime used for removing the dye colour out of the sewage. The clarified sewage, in passing through the bed, deposits the lime on and immediately under the surface, which solidifies the filtering medium, and therefore is not satisfactory. If lime be not added the bed does not remove the colour by one filtration.

Another similar bed is now being constructed, to ascertain if the colour will be totally removed after second filtration, this bed being so arranged that the effluent from the first bed will be treated on the second bed.

The author has visited several of the sewage works of the large manufacturing towns in the country, and can safely say that he has never met with a sewage of such a colour to treat as that at Hinckley, to replace the existing 8-in. main, which has become inefficient.

The object of putting down the experimental percolating beds is to ascertain whether or not a colourless and satisfactory final effluent can be obtained by passing the sewage through a primary and secondary bed without having to use any lime whatever, which now costs about £200 per annum.

The pumping plant consists of gas engines and Shone's ejectors, and is at work twenty hours per diem, with the exception of Sundays, and the dye waste received from the Sketchley dye works is measured by means of a Kent's float and recording meter, and this sewage is treated by the council for the sum of £150 per annum for 30,000,000 gallons, and at the rate of 1¼d. per 1,000 gallons beyond this quantity.

The sludge is pumped into lagoons on the ploughed land and allowed to dry, and afterwards ploughed into the land again. About 4 acres are reserved for this purpose.

During recent years about 30 acres of grass land has been converted into ploughed land in order to assist its filtraton. The crops grown on the farm are oats, mangolds, cauliflower, brussels sprouts, cow cabbage, osiers, and rye grass, and the receipts, &c., are shown in the statistics above.

This question of sewage disposal has been one of considerable anxiety to the council for some years past, and it is hoped by means of the experiments now in hand that the problem will soon be solved, for the conclusion now arrived at is that it is impossible to treat a difficult sewage on unsuitable land by means of broad irrigation and land filtration.

THE GASWORKS.

The gasworks were purchased by the local authority in 1881, and for the first complete financial year, to March, 1882, the gas made was 18,600,000 cub. ft. The debt on the works was £35,080, or £2 4s. 3d. per 1,000 cub. ft. of gas sold. The price charged for gas varied from 4s. 4d. to 3s. 9d. per 1,000 cub. ft., and there were 573 consumers.

During the year ended March 31st last the gas manufactured was 102,510,000 cub. ft., and the debt £26,640, being equal to 5s. 4d. per 1,000 cub. ft. of gas sold. The works have been practically remodelled during the past fifteen years, most of the cost of extensions having been paid for out of profits.

Since the works were purchased £7,107 has been transferred to the District Fund for the relief of the rates, and the purchase of about 9 acres of land for

recreation ground, land for the erection of cottages, and extension of cemetery.

The prices charged for gas at the present time are 2s. 6d. per 1,000 cub. ft. for lighting and cooking, 2s. per 1,000 cub. ft. for heating, 1s. 7d. to 1s. 11d. per 1,000 cub ft. for engines and business purposes.

There are 3,322 meters in use, of which 1,594 are slot, or prepayment. The council hire cookers at low rentals, and there are over 1,700 in use.

Recently gas fires have been let out on hire purchase, and about 180 have been fixed.

There is no doubt the use of gas cookers and gas fires is, and will be, a great factor in solving the smoke problem, which in the larger towns is a very serious one.

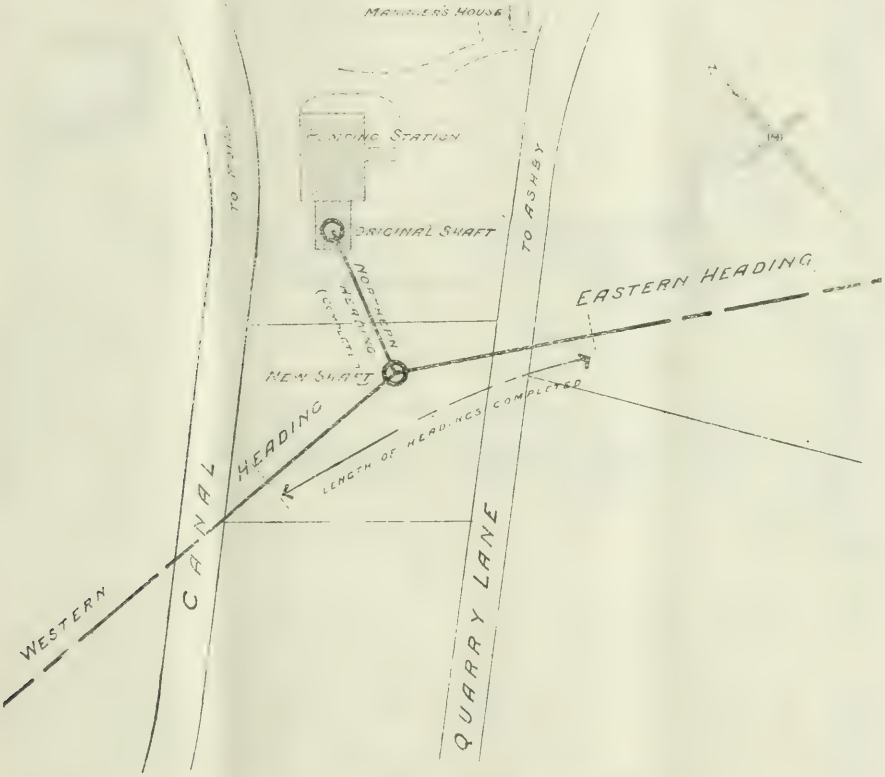
The total number of public lamps is 232 (240 burners), and of these 124 are inverted incandescent burners of 80-candle power and 116 are upright incandescent burners of 80-candle power.

WATERWORKS.

The whole of the town and a greater part of the district round is supplied by water from a disused coal shaft at Snarestone, about 14 miles from Hinckley. This supply was acquired by the council in 1888, under the Hinckley Local Board Water Act. A paper on these works was read at the annual meeting of Water Engineers, at Cheltenham, in 1912, consequently only a short description need be given now.

It was not until after eighteen schemes had been considered and six different consulting engineers engaged, and three boreholes sunk and abandoned, that the present supply was secured. The time taken up by the council in endeavouring to obtain a sufficient supply occupied twenty-two years, and during that period a considerable amount of money was expended.

Messrs. T. and C. Hawkesley, who were the engi-



Lines of Headings, Snarestone Waterworks.

The whole of the lamps except ten are lighted and extinguished by pressure, operated at the gasworks, the ten being worked by clockwork. The latter are fixed at cross roads, and are lighted at dusk and turned out an hour before sunrise. The others are lighted at dusk and extinguished at midnight.

The cost for gas, labour, &c., for the twelve months ended March last was: Gas (at 2s. 6d. per 1,000), £291 14s. 11d.; labour, £43 19s. 2d.; sundries, £8 8s. 3d.; making a total of £344 2s. 4d., or £1 8s. 8d. per burner. This does not include mantles and globes, these being provided by the gas department. The average number of mantles used per burner for the past year was 3·89.

The council have erected a tar plant for the dehydration of tar, all products being taken out of the crude tar up to 160 deg. to 170 deg. Cent., making the tar very suitable for road purposes.

The above particulars with regard to the gasworks undertaking have been kindly contributed by the engineer and manager, Mr. F. Lee.

neers, carried out the present pumping station and the whole scheme of mains, reservoir and water tower.

The shaft is 534 ft. deep, and at the bottom there is a 3-in. borehole for a further 312 ft. The supply was taken from a depth of 120 ft. in the shaft, as the water below this depth was found to contain about 20 grains per gallon of common salt.

The service reservoir at Hinckley for the low-level district has a capacity of 500,000 gallons, while the water tower for the high-level district, which originally contained 50,000 gallons, has been enlarged to hold 90,000 gallons.

The supply at the commencement of the works was 360,000 gallons per diem, but at the time of the author's appointment here it was steadily decreasing, and in 1905 the supply was only 290,000 gallons per diem. The author was instructed to report on the provision of an additional supply, and various shafts and other boreholes in the neighbourhood were tested, but none of these schemes were found

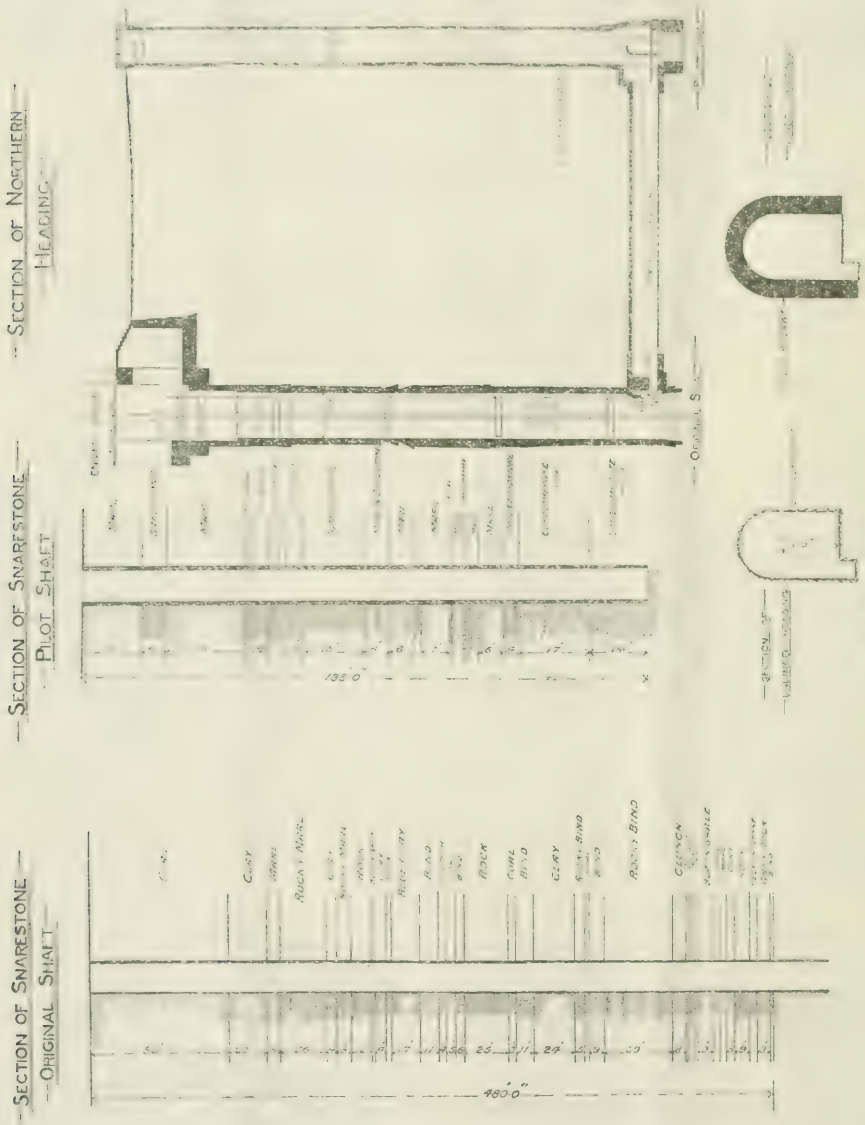
[illegible] A supply from the [illegible] was [illegible] by the [illegible] additional pumping station having to be erected. The [illegible] the driving of the headings at Snarestone, as suggested by the engineers in their original scheme, and after again consulting Messrs. Hawkesley it was decided to proceed with the work.

The [illegible] of a pilot shaft 80 ft. distant from the original shaft, the connecting of these two shafts by a northern heading, and the driving of two headings, one in a westerly and another in an easterly direction, each about ¼ mile long. The author acted as resident engineer, with various assistants.

The work of driving the headings was very slow on account of the conglomerate encountered, which could only be dislodged by gelignite and rippite cartridges, thirty of which were required per lineal yard. It was only found necessary to line the northern heading with brickwork.

It was in the eastern heading, at a point 75 yds. from the pilot shaft, that the additional water was suddenly encountered, which increased the total yield from 260,000 gallons to 650,000 gallons per diem, which quantity remained constant after six weeks' continual pumping.

It took eighteen months to construct the pilot shaft and 163 lin. yds. of headings, so slow was the daily progress owing to rock and water. The drilling was performed by a rock-drilling machine worked by compressed air, and the yield of the headings, &c., was measured by means of a Parkinson's float recording apparatus in connection with a rectangular notch 12 in. wide.



Several points gathered from experience in connection with this work were that (1) the pilot shaft was sunk too near to the original shaft, thus affecting the yield of the latter shaft, and causing great difficulty in keeping the town constantly supplied; also, the water levels in the two shafts were practically the same, and continuous pumping, both by the council's pumps and the contractor's pumps (in the pilot shaft), became necessary to keep the water down sufficiently to allow of the excavations being proceeded with. Again (2), the pilot shaft was too small in diameter. This might have been 10 ft. instead of 8 ft., for with

Hinckley Waterworks.

the 12-in. suction pipe on either side of the shaft, and the bucket lifting the excavated material continually passing up and down, there was scarcely any room left for the construction of the brick lining.

The cost of the work was as follows:—

Pumping (use of plant and machinery), £400.
Pilot shaft complete, £1,220.
Northern heading, 80 ft. long and brick lined complete, £550.
Excavation per lineal yard of unlined headings, £3 12s.
Pumping during test, 3s. per hour.

The pumping engines are in duplicate, and are of the beam type, and of a nominal horse power of 30, with a speed of twenty strokes per minute. The total lift from the floor to the top of the water tower is 350 ft. Last year it became necessary to increase the capacity of the pumps, and the lift pump, originally 10½-in. diameter, is now 13½-in., and the force pump, formerly 13¾-in. diameter, is now 17½-in. The suction pipes in the shaft were also increased from 11 in. to 15 in. in diameter. Consequently, each engine and pump can now lift 500,000 gallons instead of 360,000 gallons per diem. The cost of installing larger pumps was about £2,200.

The pumping main is 12 in. in diameter, and the whole of the water pumped is delivered into the water tower, and when this is full the water overflows into the low-level service reservoir.

In addition to supplying the town of Hinckley, the parishes of Barwell and Earl Shilton, with a total population of 7,427, are now supplied direct from the pumping main at the rate of 9d. per 1,000 gallons, the water being measured through a nest of 7-in. meters fixed in a proper meter-house at the entrance to these parishes. This scheme was carried out by the author, and when completed will cost about £11,500. The parish of Burbage, with 3,000 inhabitants, is now being provided with a supply, under the author's direction, at a cost of £4,500. In each of these cases it will be necessary to erect water towers when the draught on the present water tower at Hinckley becomes excessive.

The analysis of the water is as follows:—

Results.—Expressed in parts per 100,000.

Date of analysis.	Free and saline ammonia.	Organic ammonia.	Chlorine in chlorides.	Nitrogen of nitrates and nitrites.	Oxygen absorbed in 4 hours at 80° Fahr.	Total solid matter.	Hardness.		
							Temp.	Perm.	Total.
Jan. 21, 1914.	0·007	0·004	7·5	0·11	0·023	75	14·7	18·4	33·1

From the above analysis it will be seen that the water is rather excessive in hardness, and inconvenience is, of course, experienced from this in factory boilers, &c., softening fluid having to be extensively used. The council, having had to incur a large expenditure on the water and other departments, have been unable to consider a scheme for softening the water, but they will undoubtedly give attention to this matter at the first favourable opportunity.

The yearly expenditure, including interest and sinking fund on loans, is now about £4,371, and the revenue from all sources about £4,411, which shows that the undertaking is paying, and this profit should now increase yearly.

The amounts borrowed in respect of the waterworks are:—

Loan for original works	£45,000
,, extensions	5,344
,, additional supply	6,300
Total	£56,644

As only about £11,394 has been repaid, £45,250 still remains owing.

As regards the consumption of water in the town of Hinckley, the average daily quantity pumped is about 271,000 gallons, or about 21 gallons per head per diem, which includes 7 gallons per head for trade purposes. The quantity used by the parishes of Barwell and Earl Shilton, which are in the Hinckley Rural District, is not included in the above figures.

All new service pipes to houses are now of lead, as the iron connections put in at the time of the installation of the works were found to be wearing out and corroding, and causing a serious waste of water. The cost of the renewal of these services with lead piping has to be borne by the council. All new services are laid by the council's workmen, and have to be paid for in advance, the cost being, for a 1-in. service £2 7s., ¾-in. £1 18s., and ½-in. £1 14s., which sum includes the necessary lead piping up to the boundary of the premises, and the provision of a stop-cock and box.

In conclusion, the author wishes to express his appreciation of the assistance rendered at all times to him by his council in the execution of the foregoing new works, and to cordially acknowledge the services rendered in connection with the preparation of this paper by his staff and brother officials.

DISCUSSION OF MR. CRUMP'S PAPER.

Mr. T. W. A. Hayward (Battersea) moved a vote of thanks to the authors of papers. He said that the members of the institution held Mr. Crump in high esteem, and they were glad to hear him spoken so well of. It was not always that an engineer was appreciated in his own country. Mr. Crump's statistics showed that the town did not suffer from overcrowding, although, fortunately, the erection of a few more houses would be a good thing. They had less than five persons to each house, and less than one house to the acre, so no one could say they were overcrowded. He was glad to see that their death-rate was as low as 13·1 per 1,000, which was remarkably low for an industrial district, and showed that the health of the people was well looked after. With regard to the roads, Mr. Crump told them that during the past four years various experiments had been tried in the coating of roads with bituminous material, but sufficient information had not yet been obtained to state definitely which was the best method for the district. He asked Mr. Crump, when he had sufficient information, to supplement that by a short paper, which would be of immense service to members of the institution. Mr. Crump also referred to the difficulties of treating the roads with bituminous surfaces, owing to the roads being made with too much crown. It was a difficult thing to improve the surface of a road when the fault was caused by the improper formation of the foundation in the first place, because of the danger of taking away a portion of the foundation. It seemed that a road could be surfaced and doubly tar-sprayed for 1s. 6d. per square yard. That must be taken as only applying to Hinckley. He wished he could do it in London, but that was out of the question. The same remark applied to tar-spraying at 1d. per yard. To make the paper complete, would Mr. Crump say what he paid for wages? And he presumed that the cost of chippings was also low. He congratulated Mr. Crump on a very good specification for new streets. With respect to refuse collection, he noticed that trade refuse was collected at a charge of 1s. per load. He could not imagine how trade refuse could be collected for 1s. per load, and he did not see why the trades-people should be helped out of the rates. With regard to the provision of workmen's dwellings, they were giving an excellent cottage, well planned in every detail, and the rent was very low indeed. The baths were, in a word, up to date, and quite worthy of careful inspection. With respect to the sewers, Mr. Crump told them that certain lengths were constructed in running sand, and that the contractor had carried out the work in a satisfactory manner. Some of them who had had to carry out the construction of sewers and of foundations in running sand knew the difficulties met with.

Mr. A. D. Greatorex (West Bromwich), who seconded the vote of thanks, said they realised the difficulties of an engineer in the carrying out of public works when a 1d. rate brought in only £150. Mr. Crump was to be congratulated upon the manner in which he had carried out the various works. The council were also to be congratulated on dealing with the housing question. Many large towns had postponed dealing with this important question, while

[illegible] the student [illegible] seemed to have taken [illegible] great heartiness. He would like to see the [illegible] when developed, and he trusted Mr. Crump's estimate would be realised.

Mr. H. [illegible] Warvill (Grimsby) remarked that Mr. Crump had stated that he was experimenting with [illegible] bituminous material, but with [illegible] and not yet been definitely obtained [illegible] the best method of road construction. Mr. Crump seemed to be [illegible] that one of two of the results had been failures. Perhaps Mr. Crump would tell them which were the failures, and then they could [illegible] to keep their eyes upon. As to lowering the crown of roads, he had received definite instructions [illegible] to take the week's refuse down [illegible] and take away the clay, rebuilding the road [illegible] the foundation. In Grimsby, a 1d. rate brought in £1,100 instead of £150 at Hinckley, and [illegible] A point which struck him on the housing scheme was why the rents were not raised, because if the rents were 5s. 1d. instead of 5s. a week the scheme would show a profit. It was [illegible] enough, but at the same time it would allow the sixteen residents of these houses to pay the whole of their rent instead of being housed at some expense to the other working men in the district. With respect to the water supply, it was stated that the shaft was 534 ft. deep, and at the bottom there was a 3-in. borehole for a further 312 ft.; but the supply was taken from a depth of 120 ft. in the shaft, not borehole, as the water below this depth was found to contain about 20 grains per gallon of common salt. That was the point on which he was in doubt. Was it a misdescription? Another point was the excess of hardness of the water. The temporary hardness was stated as 14·7 the permanent as 18·4. What was the nature of the hardness? And he would like to know if it gave rise to goitre, or what was called Derbyshire neck, or any other [illegible], and the general effect it had upon the inhabitants of the district.

Dr. Bostock Hill, medical officer for Warwickshire, remarked that there were two points in Mr. Crump's paper in which he was interested—the first was the treatment of the sewage, and the second was the question of water supply. Unhappily for Hinckley, its sewage effluent ran into a Warwickshire river, and he had to be the cat to look after the Hinckley mouse. He had had to call attention to conditions which were freely admitted by Mr. Crump in his paper, but their relations had been of an amicable kind. He had endeavoured to treat Hinckley with every forbearance, knowing the great difficulties they had to contend with. Hinckley had a population of 13,000, and had relied upon tank treatment and precipitation with lime, and land treatment, and single and double treatment in the way of filtration. He was quite sure Mr. Crump and their president knew that the problem that Hinckley had to deal with with the means at its disposal was an impossible one. Hinckley had a land area of 120 acres; therefore she was dealing with about 130 persons' sewage per acre. If his fifty years' experience of sewage treatment had taught him anything at all, it was this: that no land in the world would continuously take the sewage of more than 150 persons per acre; but to do that the land must be a light loam. In Hinckley it was not light loam, but clay, and it was cumbered with the difficulty that it had a large industry which produced a waste liquor which was extremely difficult to deal with. The effluent from the dye works was one-third of the dry-weather flow. This cumbered the problem very seriously if it was only sewage, but it was a chemical liquid. He believed the Hinckley sewage works were capable of dealing with not more than thirty persons per acre; therefore Hinckley was endeavouring to deal with three or four times the amount of sewage it was possible to deal with. He could claim as much experience as anyone in bacterial treatment, and no one had done more to elucidate the problems connected with modern sewage works than their president; but he would agree with him that they must not forget that every place where the sewage was not normal must be dealt with by experiment. He was quite convinced that the experiments which would have to be carried out there would be somewhat lengthy, but he believed the facts would show that it was possible to deal with the sewage in such a way that a reasonable effluent might be produced. He noticed that the quantity of lime added was equal to 36 grains per gallon of the dry-weather flow. That was an enormous amount. He must say that great attention would have to be paid to the quantity of lime and lime salts, as these would tend to make an almost impermeable material near the top of the filter-bed unless great care was taken. He thought experiments should be made with a view to see whether it was not possible, having regard to the bacterial treatment, to eliminate some proportion of the amount of lime that was at present used; otherwise he was afraid there would be difficulties. Indeed, the whole thing was hedged round with difficulties, though he thought there was every prospect of the difficulties being overcome. With respect to the water supply, the amount of hardness was 33·1, and they would see from the analysis that the hardness was nearly half and half temporary and permanent. If manufacture by boilers did not [illegible] in Hinckley, he greatly questioned whether it would pay to soften the water. The temporary hardness might be reduced by 5, and whether a softening process was going to pay for that comparatively small reduction he had his doubts. Another point with reference to the Hinckley water was very interesting. It must be twenty-five or thirty years since he was first consulted as to this boring of water for utilising it for the Hinckley supply. It was condemned because of the large quantity of free ammonia it contained. It was much larger than at present, though the figure now given was very high, and, if they did not know something of its origin, would be almost sufficient to cause them to believe it was the result of animal pollution. He would like to congratulate Mr. Crump on the excellent work, in a general health sense, which had been done in Hinckley. If there was one thing which had occurred to him in this matter of sanitation, it was the manner in which the small towns had risen to the occasion, and raised themselves to a position sanitarily which, as compared with fifteen years ago, proved not only in Hinckley, but throughout the country, that a great amount of sanitation had been accomplished for the people who lived now, and for the generation which was to come. Although it had taxed their resources, everyone was convinced that they could make no better investment than in this cause of health.

Mr. Sholto Douglas (Kenilworth) remarked that the cost of ordinary water-bound macadam was given as 1s. 4d. per square yard, and granite, tar and pitch grouted at 1s. 7d. per yard. He could not imagine how Mr. Crump could do it at anything like the money; it was only 3d. per yard over the water-bound macadam. He had found that pitch-grouted macadam could not be done under 2s. 5d. per yard, and he could not lay tarred macadam for less than 2s. per yard. With regard to the housing scheme, he would like to ask if the balance-sheet given in the paper was the one submitted to the Local Government Board when the plans were sanctioned. The Local Government Board would not allow him to estimate less than £1 10s. per house per annum for repairs, but in Hinckley the allowance was £1 5s. With respect to the loan for these houses, he took it that they had already raised the money, otherwise they would have to pay 4 per cent interest, which would mean an addition of 3d. per week on the rent of each house.

Mr. F. Wright (Hinckley), alluding to the adoption of concrete tubes for the sewerage, said his own experience had shown him that these were very unsatisfactory in waterlogged ground. As regarded the cost of sewage disposal, the contribution of the Sketchley Dye Works—£150 per annum—seemed totally inadequate when the quantity of effluent which the local authority was called upon to treat was taken into consideration, and it appeared to be only reasonable that the company should be obliged to effect some preliminary treatment of their waste liquids prior to discharge from the works. The oxygen absorption figure in the case of the crude sewage was particularly high, but he would like to know the percentage of purification obtained.

Dr. Robinson, county medical officer of health, Leicestershire, remarked that an immense amount of lime was being used with the object of improving the effluent and putting an end to the complaints further down. The amount of lime used—36 grains per gallon—might be taken as approximately correct, but he did not think that anything like that quantity could become dissolved in the sewage. A large proportion would be deposited in the tanks as sludge. As stated in Mr. Crump's paper, compressed air was employed as an aid to clarification, and he would like everyone present to see for themselves how effective this "blowing up" method was. The combination of the excess of lime and the process he referred to produced an effluent which had the appearance of only a slightly

[illegible] water. Formerly the effluent had to stand [illegible] considerable time in the tanks. As to the question of health, dealt with in Mr. Court's paper, it was his hope that engineers and surveyors would not interfere the health of the people by any system of cutting down in the dwellings which they erected, and that district councils and all other authorities would keep an eye on the matter of bedroom space and ventilation. [illegible] space per adult should be insisted upon in every house, and nothing less than 400 cub. ft. per adult should be allowed.

The President (Mr. J. S. Pickering), in putting the vote of thanks, touched upon a number of points in Mr. Crump's paper. His view was that it was rather [illegible] to plant [illegible] and plane trees in streets on [illegible] ft., as had been done at Hinckley. Such trees were somewhat [illegible] for such narrow thoroughfares. He suggested instead the planting of small [illegible] trees, which did not interfere so much with the light. Reference had been made to the independent [illegible] payment made by the dye-works for the treatment of their wastes, and he would like Mr. Crump to give them some reason for that, especially as the company's works were outside the boundaries of the urban district. It occurred to him that they ought to contribute a very much larger amount, for it was not fair to the ratepayers of the town that they should provide sewage works for the treatment of effluents from factories outside their area. He would like also to know something more as to the process of lighting and extinguishing the street lamps from the gasworks. It appeared to be a most ingenious method, and one not generally adopted in other towns. It must effect a great saving in expenses. Mr. Crump was to be congratulated on the success which had attended his efforts to induce owners to give up land required for street improvements. Drainage and water connections were also carried at fixed prices. Such charges could not be legally insisted upon, but what had been accomplished at Hinckley was a proof that these matters could be dealt with by persuasion. He congratulated Mr. Crump also on the very low quantity of water consumed—14 gallons per head per day. With regard to Mr. Court's paper, he was afraid no power existed to enable them to carry out the suggestion as to a certain air space for every occupant of a house, and unless a local authority had a special Act of Parliament they had not the power even to govern the height of the rooms, and architects should not recommend the adoption of rooms of a height as low as 7 ft. 6 in. for working-class dwellings if they were not prepared to do the same thing in acting for wealthier clients. If in workmen's houses the space above a height of 7 ft. 6 in. was wasted, then they were only wasting the money of their wealthy clients in recommending anything above that for their houses.

The vote of thanks was carried.

Mr. Crump has communicated the following reply to the questions raised by the several speakers: In reply to Mr. Hayward, the cost of 1d. per square yard for tar-spraying is low, and this is no doubt due to the cost of the tar and granite chips; the former only costs 3d. per gallon, or £2 10s. per ton, while the latter is obtained for 5s. 3d. per ton, the quarries being quite near. A very careful record was kept of the cost of tar-spraying with distilled tar. An area of 23,500 sq. yds. was made up on four different lengths of road, and the total cost of this area amounted to £102 5s., which works out at 1·04d. per square yard; but it is only fair to state that nothing has been allowed for the use of the spraying machines, as these belong to the council. With regard to the points raised as to the running sand and water encountered during the laying of the new sewer of egg-shape concrete tubes, the invert of the sewer happened to be deeper than the layer of running sand; nevertheless, the whole of the trench had to be shuttered in; also under-drains had to be used, these being made to discharge into the existing sewer, which, fortunately, ran quite near to the new sewer. By this method we were enabled to deal with the water in the excavations. The tubes were laid on and encased with 9 in. of cement concrete, and, owing to the dimensions being 42 in. by 28 in., the tubes were jointed both on the inside and the outside. The experiments with the lengths of roads resurfaced with various materials up to the present lead us to assume that the best results have been obtained with Quarrite and Tarmac, as these two particular lengths, although situated in positions where the heaviest traffic in the town takes place, have worn exceedingly well. In reply to Mr. Whyatt, the original shaft at Snarestone waterworks was a shaft sunk for coal, and, on account of an insufficient quantity of this material being obtained, and owing to the quantity of water encountered, abandoned. An oak floor was inserted at a depth of 128 ft., and the bottom of the rising mains is 8 ft. below this floor, as it was only deemed desirable to take water from this depth for the reasons set forth in the paper. The new shaft is taken down to a depth of 128 ft., and connected to the original shaft by the northern heading, as shown in the section. With regard to Mr. Whyatt's suggestion to make the rent of the workmen's houses 5s. 1d. per week instead of 5s., in order to obviate the estimated annual loss of £2 5s. 1d. on the sixteen houses, this is impracticable, for at Hinckley all houses of 5s. weekly rental and under can be compounded for; consequently, if the rents were increased to 5s. 1d. the amount of all the rates would be doubled, and in order to get this extra amount returned it would be necessary to raise the rents to about [illegible] per week. Under these circumstances it was thought more desirable to allow the rent to stand at 5s., especially as the land was already purchased out of the gas department profits, and originally only cost 1s. per sq. yard, and not 2s. 9d. as shown in the balance-sheet. The figure of 2s. 9d. was included so that the balance-sheet might show the actual estimated loss if the land were priced at the average value of building land in that particular district. In reply to Dr. Bostock Hill's and Mr. Wright's remarks concerning the use of lime and the colour of the effluent at the sewage works, after very many experiments we find it is impracticable, without the use of a very large quantity of lime, to remove from the sewage the colour caused by the dye waste. About 40 grains of lime per gallon—an excessive amount—is used. There is, again, no large stream into which our effluent can be turned, the only outlet being a ditch; so the difficulty in which we are placed can be well understood. If we add no lime to the sewage the effluent is of a very deep colour; if lime is used, then the danger of blocking of the filter-bed arises. Up to the present the experiments we are now conducting lead us to believe that lime or some other chemical must be used—to a degree to be ascertained—in order to take out the colour. The amount of £150 per annum paid by Messrs. Hawley & Co. for treating their dye waste is a vastly different amount than was paid up to fifteen years ago, when it was only 5s. per annum. My predecessor, Mr. F. C. Cook, managed to get it increased to £75, and within the last three years it has been increased to £150. Various difficulties, which cannot be stated here, arise in connection with this question, and even if Messrs. Hawley's dye waste were discontinued, there is another large dye works in the town which also discharges its waste into the sewers, and has never paid anything extra for this privilege, nor done anything in the way of preliminary treatment; also, both works are large employers of local workpeople. As regards the analyses of the effluents, these clearly show that the effluent, after passing through some parts of the farm, is worse than if it had not been put through the ground at all, owing to the land being soddened. Another point is that sewage which has been limed gives better results than unlimed sewage. The amount of oxygen absorbed, as shown in all the analyses, is excessive, but considerable improvement has been effected since the blowing up of the sewage in the settling tanks has been inaugurated. The council have now arrived at the conclusion that some system of filtration by trickle beds must be adopted, and that is the reason why the experimental filter-beds have been put down. Mr. Douglas wished to know if the cost of the fences were included in the cost of the houses. The fencing cost 4s. 2d. per lineal yard, and the whole is included in the cost of the houses in the estimated balance-sheet. The actual contract price for each house works out at £175, and of course this price now would be higher than at the time when the contract was settled. I shall be pleased to show him a copy of the quantities and prices at any time. The cost of the new road is not included in the price of the land, the reason for purchasing the site being to open up a road between two main roads; but, as stated above, the price of 2s. 9d. per square yard would well cover this. Mr. Douglas also asks the reason for the small difference between the price of 1s. 7d. per square yard for resurfacing and grouting in with pitch and tar and 1s. 6d. for resurfacing and twice tar-spraying. The figure of 1s. 7d. is the actual cost here of the experimental lengths, while the figure of 1s. 6d. for resurfacing and double tar-spraying is the author's general estimate for this work in other towns. At Hinckley, I should have

[illegible] mentioned to be passed, the sank [illegible] only in 34 [illegible] years. I [illegible] Mr. F[illegible] [illegible] [illegible] and [illegible] [illegible] [illegible]

The Surveyor

And Municipal and County Engineer.

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PRO PATRIA.

[SIXTH LIST.]

We present herewith a sixth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Abel, V. G., county surveyor's department, West Sussex County Council, Army Service Corps.

Barfield, G. E., district building inspector, Leicester Corporation, Lieut., 5th Northern General Hospital.

Bradley, H., county surveyor's department, West Sussex County Council, Royal Engineers.

Budgett, W. H., engineer and surveyor's department, Wood Green, has enlisted for service at the Front.

Cameron, W. S., engineering assistant, Leeds Corporation, Captain, Army Service Corps (Territorials).

Chippendale, H. M., architectural assistant, Leeds Corporation, Yorkshire Hussars.

Coggill, H., engineering assistant, Leeds Corporation, Leeds "Pals" Business Battalion.

Davies, Evan L., engineer's department, Pontypridd, Glamorgan (F.), Royal Engineers.

Davies, T., second assistant, engineer's and surveyor's department, Wealdstone Urban District Council, Royal Naval Division, Royal Engineers.

Davy, P. V., county surveyor's department, West Sussex County Council, Sussex Imperial Yeomanry.

Dent, G. R., engineering assistant, Leeds Corporation, Royal Army Medical Corps (Territorials).

Dixon, Sidney, assistant surveyor, Grimsby Rural District Council, "Chums" Battalion, Grimsby, Lord Kitchener's Army.

Dobson, R., engineering assistant to the Morley Corporation, No. 1 Company, 8th Battalion, K.O.Y.L.I.

Dunk, E. F. L., county surveyor's department, West Sussex County Council, Sussex Imperial Yeomanry.

Egglestone, G. W., highway surveyor to the Weardale Rural District Council, has accepted a commission in the Reserve Battalion, 6th W.L.I., Territorials.

Ellson, C. H., clerk, Leicester Corporation, Army Service Corps (T.).

Exley, R. B., pupil, city engineer's department, Leeds Corporation, Yorkshire Hussars.

Farmer, Reginald, assistant clerk, Ashby-de-la-Zouch Rural District Council, 5th Leicesters.

Foster, L., surveying assistant, Leeds Corporation, Leeds "Pals" Business Battalion.

Freeman, F., clerk, city engineer's department, Leeds, Army Service Corps (Territorials).

Higgins, T., engineering assistant, Leicester Corporation, Naval Brigade, engineering section.

Horbury, Frank, highway surveyor, Ashby-de-la-Zouch Rural District Council, 5th (Reserve) Battalion, Leicesters.

Hosken, W., county surveyor's department, West Sussex County Council, Sussex Imperial Yeomanry.

Jackson, Percy Clifford, borough surveyor's clerk, Pontefract, Lincolnshire "Pals" Battalion.

King, J. H., engineer and surveyor's department, Wood Green, has enlisted for service at the Front.

Lee, John B., borough accountant's clerk, Pontefract, Royal Field Artillery.

Le Feuvre, W. T., electrical engineer to the Bexhill Corporation.

Marsh, J., county surveyor's department, West Sussex County Council, Royal Sussex Regiment.

Perkins, Frank K., pupil, surveyor's department, Burley-in-Wharfedale Urban District Council, West Lancs Division, Territorial Army Service Corps (Supply Section). Volunteered for foreign service.

Ryan, John, storeskeeper, surveyor's department, Pontefract, York and Lancaster Regiment.

Shaw, W. C., building inspector, Leeds Corporation, Leeds "Pals" Business Battalion.

Smith, S. G., engineer and surveyor's department, Wood Green, has enlisted for service at the Front.

Thompson, R. G., engineering assistant, Leeds Corporation, Yorkshire Hussars.

Todd, E. P., map mounter and printer, city engineer's department, Leeds Corporation, West Riding Regiment.

Witts, F., timekeeper, city engineer's department, Leeds Corporation, Royal Army Medical Corps (Territorials).

Wood, C. F., clerk, city engineer's department, Leeds, Army Service Corps (Territorials).

Wordsworth, J., engineering assistant, Leeds Corporation, Royal Army Medical Corps (Territorials).

Titford, Stanley H., secretary, the Roadmakers' Association (Incorporated), Empire Battalion, 7th Royal Fusiliers (Lord Kitchener's Army).

Mr. Richard Twelvetrees, late assistant editor of *Ferro-Concrete*, is now in France, second lieutenant, Army Service Corps (Motor Transport) Expeditionary Force.

We are pleased to be able to report that Sub-Lieut. E. D. P. Pinks, of the 1st Naval Brigade, the well-known Cambridge sculler, son of Mr. Edwin C. Pinks, of Westminster, has come safely through the trying ordeal of assisting in the defence of Antwerp, and has arrived, with the remains of his brigade, at Walmer Camp. The brigade was in the trenches outside the city for two days, and, although incessantly shelled, escaped, when the order to retire came, with comparatively few casualties. The route taken was across a pontoon bridge and through the burning city, and the point at which the brigade entrained for Ostend was only reached after an exciting march of eleven hours. The return to Dover was made on Monday night.

Housing Conditions in Birmingham.—The Special Housing Inquiry Committee of the Birmingham City Council, appointed on July 29, 1913, to investigate the housing conditions of the poor, to review the past policy of the council in administering the Housing Acts, and to make recommendations as to future action, have now issued an interim report, which will be submitted to the council on the 20th inst. There are, the report states, 43,366 back-to-back houses in the city, the condition of whose outbuildings is "degrading and disgusting." The committee are of opinion that nothing less than one private water-closet attached to each house can be considered satisfactory. There are 149,228 houses at rentals under 10s., and 67,052 under 6s.; 27,518 houses are situated in courtyards, 42,020 have no water supply inside the dwelling, and 5,028 have no separate water-closet.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

[illegible] W. Phillips, of Benhilton-road, to whom [illegible] the premium for July, has [illegible] to Lieut. Edward Arnold, and [illegible] been duly forwarded to him.

QUESTIONS.

[illegible] are invited to the following questions:—

425. Strength of Materials.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength.

429. Mechanics. A pair of blocks have three sheaves in the upper and two in the lower block. Find the pull required to raise ¼ ton, assuming ⅔ of the energy wasted.

430. Materials.—In what respects do Portland and Roman cements differ, and in what circumstances is the latter used? ("Beginner.")

431. Water Supply.—Explain the difference between surface springs and deep springs, and state the geological conditions in which each occur.

432. Ventilation.—What is the distinction between "natural" and "artificial" ventilation?

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

426. Geodesy.—Give a formula for computing the difference in height between two stations by means of the observed heights of the barometer, and state the meanings of the symbols used.

The following is a formula by Laplace:—

$$\text{Difference in height in feet} = 60345{\cdot}51 \times \left\{1 + {\cdot}00111111(t + t' - 64)\right\} \times \log\left\{\frac{b}{b'} \cdot \frac{1}{1 + {\cdot}0001(t'-t)}\right\} \times \left\{1 + {\cdot}00265\cos 2\phi\right\}$$

where b and b' = barometric readings

t = readings of "attached" thermometers

t' = readings of air temperatures, or "detached" thermometers

ϕ = latitude (mean of stations)

Note.—The accented readings are those of the higher station. Should the reader wish for a proof, one can be found in the appendix to Middleton & Chadwick's second volume on "Surveying."

Another and simpler formula for use with the compensated aneroid barometer is found in Colonel Mackesey's "Tables of Barometric Heights," and is as follows:—

Difference in height in feet =

$$67{\cdot}5\,(836 + t + t')\,(\log b - \log b')$$

where t = air temperatures at the lower and upper stations respectively

b = barometric readings at the lower and upper stations respectively

This formula can be used with the mercurial barometer if the readings are first corrected for capillarity and reduced to 32 deg. Fahr. (N. S. J.)

427. Testing Drains.—What tests should be applied to house drains before being passed? Describe any appliances used.

There are many different tests which may be applied to house drains, some better adapted to certain circumstances than others. Undoubtedly, the [illegible] the water test under pressure. The lower end of the drain should be first blocked with a screw stopper, which is fitted with an expanding rubber band. The gullies should also be plugged. A right-angle band is then temporarily fixed at the head of the drain, enabling a straight length of pipe to be fixed upright and securely propped in position. The drain is then filled with water to the top of the upright pipe. Each joint should be separately examined several times at intervals, and any small leakage at once made good with cement, more water being added until it is again level with the top of the upright pipe.

The water should be left in the drain for some time; one hour is sufficient, then, if the water is still level with the top of the upright pipe, the drain is sound and can be filled in. The filling in should be done carefully, and finished before emptying the drain; then, if any damage has been done to the pipes during the process, the fact is evident by the water in the upright pipe having decreased in level.

Another test almost as popular as the water test—is the smoke test. All the openings of the drain are plugged, with the exception of the top of the vent column. The test is applied at the lowest point, and the smoke may be generated by two methods. The most convenient is by smoke rockets, which in shape are similar to ordinary rockets, but have two small pieces of wood attached to prevent them rolling about, and to raise them above any water which may be in the drain. The rockets are lighted and placed in the drain, the stopper being inserted immediately afterwards. When smoke commences to issue from the top of the vent shaft, the opening should be plugged with cotton waste. All the joints are then inspected for signs of leaking smoke, and bad joints should be made good at once. The use of rockets, as previously stated, is the most convenient method, but their supply of smoke is limited. Therefore smoke generating machines are often used.

A smoke machine usually consists of a tank connected to a bellows. The tank is in two separate pieces, the bottom portion having double walls. The cavity between is filled with water. The top of the tank fits into this cavity, thus forming a water seal all round, and leaving the top piece free to move up or down according to the amount of smoke in the tank—on the same principle as a gasometer. The smoke is made by burning brown paper, specially prepared paper, or cotton waste, in the tank. Air is pumped through the tank from the bellows, and by means of a pipe from the tank to the centre of the screw drain-stopper smoke is forced into the drain. This test is undoubtedly the best, and the only practical one for vertical lengths of pipe, as vent columns, &c.

There are various other tests, such as pouring coloured water into the drain and examining the joints for any signs of leakage, also by pouring in liquids which emit a pungent odour, and by sending down grenades attached to a string which, when it is pulled, breaks a glass tube containing a fluid which gives off a strong smell. These last-named tests are, however, practically useless for testing new drains. (P. H., *Middleton.*)

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, **for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the** St. Bride's Press, Limited.—*Liverpool Courier.*

Business Announcement.—Messrs. John Wolstenholme & Son, Albert Iron and Brass Works, Radcliffe, Lancs, announce that they have appointed Messrs. W. E. Horsman & Son, of 127 Pendle-road, Streatham, London, S.W., their sole agents for the counties of Kent, Surrey, Sussex, Hampshire, Buckingham, Middlesex and Essex.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Birmingham T.C. (September 29th. Mr. R. H. B[illegible]). £1,818 for the purchase of the Woodvale [illegible] the extension of Selly Park. It was stated that the park had served a very useful purpose for the residents of Selly Park Ward. The Parks Committee desired to extend it, with a view to providing tennis courts and other forms of recreation.

Bradford T.C. (October 9th. Dr. W. W. E. [illegible]). £100,000 for the purpose of acquiring the site and buildings of the Bradford Royal Infirmary, and making a capital contribution towards the provision of new infirmary accommodation. It was expected that the new infirmary would cost £200,000, toward which £80,000 had been promised, but the extra order could not be raised voluntarily at present. The scheme for the purchase of the present infirmary and the contribution by the corporation to the new infirmary had been approved by the city council.

Buxton U.D.C. (September 30th. Mr. F. O. Stanhope). £11,560 and £1,300 for the purpose of mineral water baths.—The surveyor, Mr. F. Langley, stated that under the Act of 1904 the council acquired the hot baths and mineral water rights. The baths were acquired for the convenience and benefit of visitors. They were all one undertaking and under one administration. In the proposed scheme the baths would have concrete floors, all the ordinary woodwork would be replaced with Austrian oak, the walls surfaces and ceilings would be tiled, electric light and bells would be fitted, the interior would be decorated, and the whole place would be brought up to the most modern [illegible]. The £1,300 was excess expenditure on the work recently carried out which was entirely unforeseen. It was thought at the time that the estimate was low.

Enfield U.D.C. (September 24th. Mr. W. M. Cross). £1,800 required for an additional percolating filter at the council's sewage farm.—The clerk, Mr. T. W. Scott, stated that the filter which it is proposed to construct is very similar to and adjoins five others erected some few years ago. The existing filters are acting very satisfactorily, but having regard to the increasing quantity of sewage to be dealt with, and to the necessity of securing an effluent of a quality that cannot be objected to by the Lee Conservancy Board, into whose river it is discharged at a point in Tottenham below the intake of the Metropolitan Water Board, it is felt that an additional filter is required. The surveyor, Mr. R. Collins, explained the system of sewage disposal, and the inspector afterwards visited the farm. Mr. Cuthbert Brown, surveyor to the Edmonton Urban District Council, in whose area the farm is situated, was also present at the inquiry.

Ivybridge U.D.C. (October 8th. Mr. W. M. Cross). £4,000 for works of water supply.—It was stated that the object of the proposed loan was to complete the construction of the waterworks. The original estimate for the work was £8,100. The contracts were let in November, 1913, and the sum expended on the works up to March 31st last and the amount required for their completion totalled £12,100. This excess had to be caused by (1) the rise in the price of materials and labour, estimated to account for £2,[illegible] and (2) the heavy cost of contingencies and engineering, and the purchase of land and easements, amounting to £[illegible] and £515 respectively more than the original estimate. The district council asked for a period of sixty years for the repayment of the loan. Mr. H. Francis, the engineer for the scheme, gave details of the proposed new works, the necessity for which, he said, had been recognised by the Local Government Board for some years.

Kingstown (Co. Dublin) U.D.C. (October 6th. Mr. [illegible]). £7,900 for the erection of thirty-six houses for the working classes at Sallynoggin.—It was stated that the council had already built a large number of houses, but more were required. At present over 200 houses which were occupied were unfit for human habitation. Evidence was given by the council's surveyor, Mr. Joseph Berry.

Lancaster T.C. (October 1st. Mr. A. W. Brightmore).—£1,680 for the provision of conveniences in Stonewell, Market-square (under the old town hall), King-street (adjoining the Assembly Rooms), and at Penny-street Bridge. The estimated cost of the conveniences was stated to be: Stonewell, £500; Market-square, £500; King-street, £200; Penny-street, £480.

Newquay U.D.C. (October 7th. Mr. W. M. Cross).—£700 for works for private streets improvements in St. John's-road and Golf-terrace, and £2,000 for works of sewerage.—It was stated that the proposed schemes would considerably help employment during the anticipated period of distress. The drainage scheme was to deal with storm water, and to remedy frequent overflows in Tower-road, Central-square, Marcus-hill, Harbour-crescent, and by the railway station.—The surveyor, Mr. J. Ennor, submitted details of the scheme.

Reading T.C. (September 28th. Mr. F. H. Tulbeck). £6,700 for the widening and improvement of Oxford-street, and £430 for the construction of a convenience for women.—The borough engineer, Mr. J. Bowen, offered an explanation of the plans in detail. It was stated that the Road Board had agreed to make a contribution of one-half the estimated cost of the proposed road improvement.

Rhyl U.D.C. (October 9th. Mr. P. M. Crosthwaite).—£4,500 for the rebuilding and enlarging of the amphitheatre at the pier entrance. It was stated that the architect's and quantity surveyor's estimates varied from £4,000 to £4,756, and the inspector remarked that if those estimates were prepared before the war the council could not now expect to receive tenders anywhere near those amounts.—There was considerable opposition to the proposed scheme.

St. Annes U.D.C. (October 7th. Mr. A. G. Drury). £6,500 for the work. The council, it was stated, have leased 20 acres of the foreshore from Mr. Chilton at £50 per annum, and on a portion they propose to construct baths, and at some future date to make a marine lake on the greater part of the land. The bath, which it is expected will be finished for next summer, will be 330 ft. long and 120 ft. wide, and while deep enough for a certain width for important swimming contests, provision will be made for the absolute safety of the youngest bathers.

Selby U.D.C. (September 30th. Mr. W. O. E. Meade-King).—£3,800 for the purchase of property for the purpose of making a new road from Gowthorpe-street to Flaxley-road.—It was stated that the proposed new road will afford direct communication between two important thoroughfares, the extremities of which are in view of each other, but access from one to the other can only be gained by a circuitous route.

Swaffham R.D.C. (October 5th. Mr. H. A. Chapman).—£1,238 for the provision of workmen's houses.—It was asked that the loan for the land—£98—should be spread over eighty years, and the loan for the six houses—£1,140—should be spread over sixty years.

APPLICATIONS FOR LOANS.

Aberystwyth T.C.—£547 for alterations at the town hall.

Cambridge T.C.—£6,450 for the extension of the guildhall.

Carlisle T.C.—£22,000 for works of sewerage.

Coventry T.C.—£1,430 for the Parkside improvement.

Finchley U.D.C.—£1,600 for sewerage works.

Gainsborough U.D.C.—£180 for a new sewer.

Hessle U.D.C.—£3,500 for the purchase of land for street improvement.

Holmfirth U.D.C.—£3,285 for a housing scheme.

Kendal T.C.—£9,450 for gasworks extensions.

Martley R.D.C.—£3,500 for a sewerage scheme.

Pontefract T.C.—£3,000 for gas main extensions.

Ramsbottom U.D.C.—£3,276 for road improvement.

Rathmines U.D.C.—£10,000 for the provision of houses.

Tonbridge U.D.C.—£1,000 for a new promenade.

Tunbridge Wells T.C.—£4,155 for sewerage works.

West Bromwich T.C.—£5,547 for generating plant and cable.

West Riding C.C.—£7,669 for a sanatorium.

LOANS SANCTIONED.

Baldock U.D.C.—£870 for the purchase of land for sewage disposal.

Bangor T.C.—£1,165 for the purpose of the gas-works.

Barry T.C.—£6,900 for the erection of twenty-four houses.

Boston R.D.C.—£8,000 for the erection of workmen's cottages.

Bournemouth T.C. — £1,000 for sewerage and surface water drainage.

Bradbury U.D.C.—£2,800 for a recreation ground.

Brighton T.C.—£6,317 for thirty years for the erection of an infants department at the Coombe-road central school; £214 for a period of ten years for furniture for same; and £685 for a period of forty years for the purchase of 93 Ditchling road, for the purposes of public baths.

Darlaston U.D.C.—£368 for the purpose of a recreation ground.

Darwen T.C.—£650 for bowling greens and tennis courts.

Derbyshire C.C.—£3,650 for additions to the asylum.

Filey U.D.C.—£250 for street improvement.

Finchley U.D.C.—£26,000 for 100 dwellings.

Glastonbury T.C.—£900 for works of water supply.

Godstone R.D.C.—£2,190 for the provision of houses at Lampsfield.

Gosport U.D.C.—£1,915 for the construction of a new road.

Knaresborough R.D.C.—£260 for works of water supply at Follifoot.

Midhurst R.D.C.—£780 for cottages at Chithurst.

St. Thomas R.D.C.—£5,500 for the Topsham water supply.

Scarborough T.C.—£16,700 for the South Cliff improvement.

Tilbury U.D.C.—£11,367 for a housing scheme.

Torquay T.C.—£850 for road widening.

Ulverston U.D.C.—£5,363 for sewerage and sewage disposal works.

Willesden U.D.C.—£25,000 for electricity extensions.

FORTHCOMING INQUIRIES.

OCTOBER.	£
20.—**Berwick.** For works of water supply (Mr. W. M. Cross)	—
20.—**Chester.** For the purposes of street improvement (Mr. Edgar Dudley) ...	305
20.—**Croydon.** For street improvement and works of drainage (Mr. R. H. Bicknell)	61,931
20.—**Horbury.** For the purposes of a public hall and a recreation ground (Major J. Stewart)	8,900
20.—**Redruth.** For works of water supply (Mr. R. G. Hetherington and Dr. S. W. Wheaton)	4,250
20.—**Settle.** For works of sewerage (Mr. F. O. Stanford)	900
21.—**Accrington.** For works of sewerage (Mr. F. O. Stanford)	2,000
21.—**Cramlington.** For works of sewerage and sewage disposal (Mr. W. M. Cross) ...	3,600
21.—**Hemsworth.** For sewage works improvement (Mr. A. G. Drury)	2,590
21.—**Sheffield.** For street improvement (Major J. Stewart)	9,512
21.—**Southend.** For the purposes of the gas-works, public conveniences, and shelters (Mr. H. R. Hooper)	7,709
21.—**West Bromwich.** For park extension (Mr. Edgar Dudley)	650
22.—**Heywood.** For alterations at the sewage works (Mr. F. O. Stanford)	4,200
22.—**Ilford.** For the provision of a park (Mr. Edgar Dudley)	13,328
22.—**St. Columb.** For housing and works of drainage (Mr. R. G. Hetherington) ...	560
22.—**Swinton.** For a housing scheme (Mr. Courtenay Clifton)	7,900
23.—**Evesham.** For works of water supply (Mr. M. K. North)...	2,500
23.—**Huthwaite.** For the purposes of the gas-works (Mr. A. G. Drury)...	—

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

What has been the effect on town clerks, clerks to urban authorities, and other municipal officials, on the receipt of the copies of literature which has emanated from the Local Government Board in connection with the "Prevention and Relief of Distress"? Would not the perusal of these complicated documents give them much food for thought, and will they not be glad that there could have been no lack of employment for those who had to prepare these documents, nor for those who have to master the contents?

* * * *

Would it not be possible for some geological expert, who was also somewhat acquainted with the needs of the highway engineer, to write a book on "Road Stones" on the same lines as that excellent book "Wood," by Mr. G. S. Boulger, F.G.S., which was published in 1902, and which contained chapters on various subjects that might equally be applied to stone? Could not, for instance, chapters be given on the origin and structure of various road stones, how they are to be recognised, for what purposes they are suitable, their defects, and how to test and select them?

* * * *

Will not the proposed "Farm Institutes" which are to be established in various agricultural centres in Great Britain, under a grant of £325,000 from the Development Commissioners, greatly assist in solving the problem of how to get the people back to the land? Could not the opportunity also be taken to establish some large beetroot sugar manufactories in this country now that the war has, more or less, cut us off from this commodity? Has it not been shown by many experts on this subject of profitable beetroot growing that such a project would bring a large number of acres of land back into cultivation, and employ a considerable amount of labour?

* * * *

Does not Mr. Eastwood's thoughtful and clever article on "Traffic Factors" in the issue of The Surveyor of the 2nd inst. clearly demonstrate the difficulty of obtaining a true coefficient upon which any fixed and reliable formula could be framed as a guide to the construction of the road of the future? Shall we not have to be satisfied, for some time to come, with a sort of empirical division between roads of light, medium, and heavy traffic, ascertained by traffic observations and calculated on the basis of tons of traffic per annum per yard width of carriageway?

* * * *

Is it a fact that the War Office is now engaged in erecting huts in various parts of the country in order to accommodate the vast number of men who are forming our new Army? Should not this work give employment to a large number of men who might otherwise be out of work? Will it not also tend to change the rural character of some of the districts in which these "hut towns" are being formed? Will these huts be erected in a substantial manner and allowed to remain permanently, as was the case at the time of the Crimean War?

* * * *

Why have the London gas companies found it necessary to raise the price of gas to their consumers? Would it not have been supposed that, as during the war less coal would be exported, the price of that commodity would have fallen, and that consequently there should be no increase in the price of gas? Or is the increase due to there being less consumption, rendering it necessary for the companies to put up the price in order to maintain their dividends?

* * * *

Are medical men and bacteriologists yet agreed as to the safety of swimming-bath water which is changed only once every three months, or even at less frequent intervals? Is it certain that disease germs are rendered innocuous or are altogether eliminated by filtration and aëration, or is the water thus treated merely cleansed of its dirt and human emanations, including the chlorine? Is the electrolytic treatment of the water as practised at Poplar more reliable, and does it actually sterilise the water?

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are those the more important projected works of which particulars appear below: Buildings, Bedford £[illegible], Glasgow £14,000, Scarborough £10,000, housing and town planning, Hartlepool £15,000, Liverpool £25,000, Morley £18,856, roads and materials, Carlisle £12,500, Hackney £17,200, Walsall £11,197, sewerage and sewage disposal, Carlisle £22,000, [illegible] £17,000, Irlam £15,000, water, gas and electricity, Atherstone, Plymouth. Particulars of other projected works will be found in the "Local Government Board Inquiries" pages.

BUILDINGS.

Birkenhead T.C.—The services of Mr. T. T. Rees, architect, have been engaged in connection with the town improvement scheme, including the provision of industrial dwellings, the cost of which is estimated at £72,000.

Brighton T.C.—Councillor Lintott at a recent council meeting stated that the pavilion had been painted by the borough surveyor, Mr. H. Tillstone, under direct labour, and that the estimate was £800, plus 10 per cent for having men from the Distress Committee. The estimate on that occasion was £880, but the work was done for £745. The result went to show that it had been proved economical for the painting to be done by direct labour. The council now agreed that the internal painting at the borough sanatorium and the repainting of the corporation property in Dewe-road be carried out by direct labour.

Bristol T.C.—A committee has been appointed to report on the desirability of the construction of a bridge across the floating harbour from Freshford-lane in a direct line with Bell-avenue, Queen-square.

Canterbury T.C.—The council have approved the plans of the city surveyor, Mr. A. C. Turley, for the extension of the small-pox hospital.

Deptford B.C.—The council have approved the plans of Mr. A. W. S. Cross for combined baths, wash-houses, and library, at an estimated cost of £5,000.

Derby T.C.—The tender of Messrs. Pegg & Bailey, at £5,159, has been accepted provisionally for the erection of a Carnegie branch library at Alverston, and the tender of Messrs. R. Weston & Son, at £4,770, has also been accepted provisionally for the Normanton branch library.

Glasgow T.C.—It is intended to expedite the scheme for the Bridgeton public hall, which is estimated to cost £14,000.

Portrush U.D.C.—The surveyor has received instructions to prepare a rough sketch for improvements to the town hall, and the erection of public baths, at a cost not exceeding £5,000.

St. Germans R.D.C.—It has been agreed to join with the Saltash Town Council and the Torpoint Urban District Council in promoting a scheme for an isolation hospital.

Scarborough T.C.—Application is to be made to the Local Government Board for sanction to borrow £10,000 for making a bathing pool on the north side of the town. This is in addition to the bathing pool which is now being made on the south side of the town.

Taunton T.C.—The borough surveyor, Mr. D. Edwards, has received instructions to prepare plans and specifications for the erection of a covered swimming bath and slipper baths, at an estimated cost not exceeding £3,000.

West Riding C.C.—The Highways Committee have agreed to spend £1,700 in widening Penistone Bridge over the river Don, carrying the Doncaster and Salter-brook main road.

HOUSING AND TOWN PLANNING.

Arundel T.C.—A letter has been received from the Local Government Board adverting to a previous letter with reference to the council's scheme for the erection of workmen's dwellings, and stating that it was not contemplated that any means otherwise than by loan would be allowed under the Housing (No. 2) Act, 1912. If, owing to the war, the council were involved in any additional expenditure in carrying out the scheme, the board would be prepared to consider an application for an additional loan to cover it.

Ayr T.C.—The Housing Committee have submitted a report that they were satisfied there was a scarcity of houses in the burgh, and were of opinion that the council should proceed with a scheme for the erection of two-story tenements containing two and three apartments, the number of houses meantime not to exceed fifty. The committee were further of opinion that no single-apartment houses should be included in the new tenements, but that existing properties should be acquired and converted into that class of house.

Bristol T.C.—The Health Committee have adopted a resolution of the Scarborough Corporation affirming that the procedure for the acquisition of land and other property for housing and improvement purposes is cumbrous, costly and dilatory, and the amount payable for compensation frequently excessive, so that the introduction of a comprehensive measure for simplifying and cheapening the present procedure is very desirable.

Carnarvonshire C.C.—The medical officer of health, Dr. E. L. Parry Edwards, reports that the housing problem in the county demands very serious attention. At the end of the year there were about 626 workmen's dwellings vacant, of which one-half were in the urban district of Bethesda, and 645 houses were reported as unfit for human habitation. There is a general dearth of workmen's dwellings in the county with the exception of the district mentioned and the Ogwen, Bangor and Geirionydd districts. The wages earned by the average artisan are not sufficient to enable them to pay a rent at which new sanitary houses can be put up, and therefore the majority of the district councils endeavour to improve existing dwellings.

Chard T.C.—The Local Government Board wrote inquiring into the present position of matters in connection with the council's proposed housing scheme, and it was resolved to reply that the matter had been postponed on account of the present state of affairs, but that the council had now decided that the borough surveyor, Mr. E. W. Hearn, should go forward with the specifications with a view to the council, at the next meeting, inviting tenders for the erection of three houses.

Essex C.C.—It has been agreed to build thirty cottages for roadmen.

Hartlepool T.C.—The council have approved a housing scheme, which is estimated to cost £15,000. The area to be dealt with is the Cleveland-street and Ropery-lane district, in the centre of the town. One hundred and eight houses are to be pulled down, and at present the corporation intend to build thirty-four new ones. An improvement scheme to cost £8,400 in the same neighbourhood was approved recently.

Hull T.C.—The council last week resolved to proceed with the scheme of the Sanitary Committee, involving the clearing of the New George-street area. By this scheme, under the Housing and Town Planning Act, 252 houses are to be provided at a cost of £67,150; the site is estimated to cost £36,000, the street works £4,120, and the charge on the rates will be £2,561 per annum.

Liverpool T.C.—It has been agreed to proceed with the erection of houses on the Gore-street, Jordan-street and Sparling-street areas, at an estimated cost of £25,000.

Morley T.C.—It is intended to build eighty-six industrial dwellings, at an estimated cost of £18,856.

Motherwell T.C.—The council have approved a housing scheme on the cottage system, and last week they accepted a tender for the work at £15,500.

Newcastle-under-Lyme T.C.—It has been agreed to pay a sum of £100 to Mr. Stephen Heath (in addition to the sum of £4,626, the amount of his tender for the erection of twenty-nine working-class dwellings on the Lower Green), in consequence of the increased price of building materials on account of the war.

Stourbridge U.D.C.—A decision has been reached to build twenty houses to relieve immediate pressure,

Surbiton U.D.C.—The Local Government Board have [illegible] the preparation of a [illegible] for the area referred to in the council's [illegible] the [illegible] and the land used for allotments and recreation ground. The board has included the property of all the objectors.

Westhampnett R.D.C.—Inquiries are being made [illegible] the advisability of [illegible] several parishes.

PARKS AND OPEN SPACES.

Dumfries T.C.—The municipal bowling greens have proved a success and are self-supporting.

Hessle U.D.C.—It has been decided to lay out a recreation ground at an estimated cost of £1,000.

Rothesay T.C.—It has been agreed to extend the municipal golf course by about 1,000 yds.

REFUSE COLLECTION AND DISPOSAL.

Rothesay T.C.—Notice of motion has been given for the provision of a refuse destructor.

ROADS AND MATERIALS.

Bromley R.D.C.—The council have approved the plans of the surveyor, Mr. R. Craig, for the improvement, at an estimated cost of £268, of Crofton-road at the point where it joins the main road at Locksbottom, and the clerk has been directed to apply to the Road Board for a grant towards the cost of the work.

Cardiff T.C.—The city surveyor, Mr. W. Harpur, last week reported to the Tramways Committee that the reconstruction of the tramway track in Queen-street was started on June 20th, and that 1,305 yds. had been constructed, an average of 90 yds. per week. The total cost was £5,174, or £3 19s. 3d. per yard of single track. In Ninian-road 1,068 yds. had been constructed since June 15th—69 yds. per week on an average. The total cost was £4,600—£4 6s. 2d. per yard. Mr. Harpur said that his estimate for Ninian-road was £4 8s. 9d. per yard.

Carlisle T.C.—The council have resolved to undertake the improvement of the main roads of the city by re-forming them with tar-macadam at a cost of £12,500.

Chard T.C.—The town council last week decided, on the recommendation of the Road Committee, to proceed at once with the widening of Furnham-road, and the borough surveyor, Mr. E. W. Hearn, presented plans for the improvement of the Cornhill and the widening of a portion of Fore-street, which were approved and ordered to be forwarded to the county council with the object of obtaining a grant towards the cost of the work.

Chelmsford T.C.—The scheme of the surveyor, Mr. Percival T. Harrison, for the widening of Galleywood-road, at an estimated cost of £5,000, has received the provisional sanction of the Road Board.—The contractors for the wood block paving in Duke-street, Messrs. William Griffiths & Co., Limited, wrote with reference to their contract. The work has been postponed at the suggestion of the military authorities, and they suggested that the blocks now on charge should be delivered to the council and paid for. It was agreed to pay Messrs. Griffiths £500 in respect of the blocks, and also £500 of the retention money—£617—held in connection with the High-street wood paving completed last year.

Dover T.C.—Upon the suggestion of the assistant surveyor, it has been agreed to spend this year £800 on the relaying of the Folkestone road tramways, the balance of the estimated cost—£1,200—to be spread over the next two years. The work will be done by direct labour.

East Ham T.C.—With respect to an unexpended balance of £2,000 from a loan of £8,140 granted by the Local Government Board for works of channelling, it has been agreed to ask the board to authorise this being expended for materials required to channel other roads, provided they made a grant for the work to be executed by Distress Committee workmen.

Erpingham R.D.C.—The sanction of the Local Government Board has been received to the loan for making up Hilda-road, Mundesley, and the council have authorised the clerk to negotiate for the loan.

Guildford T.C.—A letter has been received from the Road Board stating that if there was any likelihood of any considerable amount of unemployment in Guildford the board would be prepared to consider applications for grants towards works involving the employment of a maximum amount of labour. The Road Board would be prepared, in such circumstances, if the Local Government Board so advised, to consider the improvement of London-road.

Hackney B.C.—Towards carriageway and paving works estimated to cost £17,200 the Road Board have sanctioned a grant of £10,900.

Holmfirth U.D.C.—A road widening scheme estimated to cost £304 has been approved.

Ilfracombe U.D.C.—The surveyor, Mr. O. M. Prouse, has received instructions to make up several streets under the Private Street Works Act.

Jarrow T.C.—The borough surveyor, Mr. J. S. Weir, has been authorised to assist the county surveyor in preparing a scheme with regard to Boldon-road for the purpose of submission to the Road Board, and that, if necessary, he should accompany the county surveyor to London to interview the board.

Knaresborough R.D.C.—It has been agreed to carry out private street works at Westminster-drive, Pannal, and Killinghall.

Lancaster T.C.—The borough surveyor, Mr. A. G. Bradshaw, submitted recently a report on various schemes which might be carried out as relief works in order to mitigate any local distress if such should arise. These schemes referred to a proposed road through Greaves Quarry, and the widening of Buck-road beyond the wagon works. The borough surveyor was instructed to communicate with the Road Board and make inquiries as to whether any grants could be obtained towards any of the proposed works in Buck Ward. The borough surveyor's estimate for the work in connection with the Greaves Quarry-road was approved.

Leicester T.C.—Road widenings and footway construction are to be carried out at an estimated cost of £22,580.

Littlehampton U.D.C. — The surveyor, Mr. H. Howard, has been instructed to prepare a list of the properties not yet connected with the sewers, in order that notices might be served requiring the work to be carried out forthwith. Mr. Harwood said it was absolutely necessary, in order that roads should not be torn up after repair, that the work should be done at once.

North Walsham U.D.C.—A letter was read from the county surveyor as to the proposed improvement and repair of the Bacton and Cromer roads for military purposes, the expense being borne by the Road Board. It was resolved that the surveyor of the council, Mr. J. W. Stevens, be instructed to assist the county surveyor in the carrying out of the work so far as it affects North Walsham.

Oldham T.C.—With the object of providing work for the unemployed, the council last week decided to apply to the Local Government Board for borrowing powers for £8,255 for improvement schemes, also for a grant from the Road Board towards the sum of £9,000, to be spent on two improvements in Rippondon-road.

Perthshire C.C.—At a meeting recently of the Blairgowrie District Committee, it was reported that contracts had been accepted for a scheme of improvements of the Bridge of Cally road (£1,554) and on the Perth Coupar Angus road (£1,014). A letter was read from the Road Board stating that the proposal for a comprehensive scheme of road improvements, estimated at £25,000, superseded the £3,000 scheme, and that the board were not prepared to proceed with the grant of £1,500 indicated to the latter scheme.

Porthcawl U.D.C.—The tender of Messrs. Vicary Bros., of Barrow, has been accepted for private street works.

Reigate R.D.C.—The surveyor, Mr. A. J. Head, has been instructed to make up the Charlwood-lane footpath with Charlwood stone and clinker.—With respect to the supply of 100,000 gallons of tar for surface treatment, the surveyor has been advised to divide the order between three companies, and to ask for a discount in each case of 2½ per cent on monthly accounts. The Redhill Gas Company's tender was 2⅞d. per gallon, or 2⅛d. per gallon if put into the council's railway tanks; Reigate Gas Company, 3d. per gallon, less 2½ per cent discount on monthly accounts; and Horley Gas Company, 3d. per gallon.

Rhyl U.D.C.—With regard to the application of the council for permission to borrow £2,500 for further improvements on the Promenade, the Local Government Board have intimated that they would not withhold their sanction under the circumstances if the council started the work before an inquiry was held.

Stirling C.C.—It is reported that arrangements have been concluded with the Denny Town Council and the Central District Committee for the widening of part of Broad-street, Denny.

Stockton T.C.—Three important road schemes, consisting of widenings and the construction of a new road, are under the consideration of the council.

Tavistock R.D.C.—The question of purchasing a steam road roller has been referred to committee for report.

Walsall T.C.—The Streets Committee recommend the council to apply for a loan of £11,197 for the purpose of road improvement and other works.

Warrington T.C.—The Street Improvement Committee have passed a resolution to the effect that the Paving and Sewerage Committee be recommended to proceed with the re-forming and paving of Buttermarket-street, where widened, as soon as practicable. The last-named committee have considered the question, and the borough surveyor, Mr. A. M. Ker, has been instructed to bring the matter before the Tramways Committee with a view to deciding whether they require a tramway track, and that if not application be made to the Local Government Board for sanction for a loan for the repaving.

Westhampnett R.D.C.—It has been agreed to pass an estimate of £560 for tar treatment during the ensuing season.

Wolstanton U.D.C.—The surveyor, Mr. W. F. Slater, has received instructions to prepare a scheme for widening Milehouse-lane, the estimated cost of which is £2,000.

SEWERAGE AND SEWAGE DISPOSAL.

Alcester R.D.C.—Messrs. Dodd & Dodd have prepared a scheme for sewage disposal estimated to cost £2,237.

Carlisle T.C.—The Health Committee have approved an estimate at £22,000, submitted by the city surveyor, Mr. H. C. Marks, for sewerage works in the outlying portions of the city, as required by Parliament in granting the extension of the municipal boundaries.

Coalville U.D.C.—The Highways Committee are considering plans prepared by the surveyor, Mr. L. L. Baldwin, of the proposed sewer in Meadow-lane, which is estimated to cost £2,000.

Ely U.D.C.—A scheme of sewerage is to be carried out at an estimated cost of £17,000.

Irlam U.D.C.—Proposals have been made for alterations and extensions at the sewage disposal works, the cost of which is estimated at £15,000.

Romford R.D.C.—The engineer, Mr. Fairley, has received instructions to prepare an estimate of the cost of a sewerage scheme for Upminster.

Shoreham U.D.C.—The surveyor, Mr. A. W. Nye, has been instructed to obtain the necessary particulars to enable the General Purposes Committee to consider the request of the military authorities for an extension of the drainage system to improve the sanitation of the local camp.

Uwchaled (Denbigh) R.D.C.—The council have instructed Messrs. Berrington, Son & Watney to prepare a scheme of sewerage and sewage disposal for Cerrig-y-druidion.

WATER, GAS, AND ELECTRICITY.

Atherstone R.D.C.—It has been agreed to adopt a scheme prepared by Dr. Lapworth, in conjunction with Mr. H. J. Coleby, the council's engineer, for supplying the whole of the district with water from the new boring at Warton. Testing operations had proved the daily yield of the well to be 240,000 gallons, or about 90,000 gallons in excess of the requirements of the district. The total estimated cost of the scheme is £18,158.

Barnstaple R.D.C.—It is announced, in reference to Combemartin water scheme, that Mr. Luke, the engineer, has very much modified his plans as to the quantity of land wanted. Instead of purchasing 51 acres, only just over 8 acres will now be required. The clerk has received instructions to make inquiries in connection with the smaller scheme, and to forward the replies to the parish council for their views.

Clogher R.D.C.—The medical officer of health, Dr. H. Warnock, calls the attention of the council to the pressing need of a proper water supply.

Coleraine U.D.C.—The surveyor has been instructed to prepare a plan and estimate for the construction of a covered storage tank, 60 ft. by 60 ft., at Ballyversal reservoir.

Downpatrick R.D.C.—An arrangement has been reached with a local company to light the streets by electricity.

Holywood U.D.C.—It is proposed to provide temporary means of water storage pending the construction of the reservoir, for which Parliamentary powers have been obtained.

Hove T.C.—The council have adopted the recommendation of the General Purposes Committee to carry on the electricity undertaking as a municipal concern.

Kidderminster R.D.C. — The council last week approved an agreement with the Stourbridge and District Water Board for a supply of water to the parish of Churchill for thirty years at 9d. per 1,000 gallons. The clerk said he had asked the Local Government Board to expedite the carrying out of the scheme, and that of Wribbenhall water supply, so that the work could be done while there was necessity to find employment for those who were out of work.

Kirkintilloch T.C. — An engineer has received instructions to report on a proposed site for an additional reservoir at Autermony.

Lisburn U.D.C.—A resolution has been passed confirming the purchase of additional land for waterworks purposes, and a statement was made showing that at present the reservoir was being excavated and that negotiations are proceeding relative to obtaining an increased supply to guard against the possibility of a shortage in the future.

New Mills U.D.C.—The Gas Committee have adopted a proposal for a new gasholder estimated to cost £7,000.

Plymouth T.C.—The Water Committee have had referred back to them a proposed scheme for increasing the means of conveying water between Burrator and Roborough reservoirs, which is estimated to cost £60,000.

Poole T.C.—The question of the provision of a reservoir has been deferred, and instead it has been decided to take steps to provide such additional pumping capacity as may be necessary.

Richmond R.D.C.—The council proposed to postpone the water supply scheme for Newsham owing to the war, but the Local Government Board wrote that they did not consider the council would be justified in doing so for the reason stated. The council, in the circumstances, have resolved to proceed with the scheme.

Sheffield T.C.—The question is being considered of building an electric supply centre in Bow-street, at an estimated cost of £42,000.

St. Pancras B.C.—Renewals of electricity cables and feeders are to be provided at an estimated cost of £5,900.

Stirling C.C. Negotiations have been opened up with a view to the formation of a combination of water authorities, subject to the preservation of the existing interests of the various bodies concerned.—It has been referred to the Water Commissioners to consider the advisability of providing additional storage accommodation on the Touch Hills.

Uwchaled (Denbigh) R.D.C.—The council have in hand the question of providing an efficient water supply for Cerrig-y-druidion, and have instructed Messrs. Berrington, Son & Watney to report as to the best means of supply.

MISCELLANEOUS.

Flintshire C.C. Negotiations have been opened with the Development Commissioners with the object of securing a grant of £20,000, free of interest or repayment of capital, for the Mid-Flintshire light railway scheme.

Southwold T.C.—Several schemes have been prepared for providing employment, including a scheme

[illegible] Bury Creek to [illegible] Street, and [illegible] from the [illegible] the [illegible] Bury [illegible] 1914. A [illegible] committee has been appointed to advise with the borough surveyor, Mr. J. S. Hurst, on the schemes and report to the council. [illegible] being a report [illegible] of the [illegible] Unemployment Acts, London.

Twickenham U.D.C.—It has been decided, subject to the consent of the Local Government Board, to lease to the Twickenham Rifle Club an open piece of land at the [illegible] disused works for a rifle range, at a rental of £8 per annum. The council will erect the necessary fencing at an estimated cost of £75, and will construct the range at the cost of the club.

PERSONAL.

Mr. William Boyd has been appointed assistant road surveyor to the Cupar District Committee of the Fifeshire County Council.

Mr. A. G. Knight, assistant sanitary inspector to the Twickenham Urban District Council, has been granted sick leave of absence for a period, if necessary, of six months.

Mr. A. E. Adams, borough surveyor of Chippenham, has been voted £100 for his services in connection with the filtration and aëration of the water supply, and the housing scheme.

Mr. D. H. P. Stevenson, of Nottingham, has been appointed surveyor and inspector of nuisances to the Leake Rural District Council during the absence of Mr. O. G. Laban on active service.

Mr. I. E. Williams, of the borough surveyor's department, Pwllheli, has been appointed surveyor and inspector to the Criccieth Urban District Council during the absence of the surveyor, Mr. G. H. Williams, on military service.

Mr. J. S. Coverley, formerly surveyor to the Penmaenmawr Urban District, died on the 6th inst., we regret to state. After he had retired from the office of surveyor, Mr. Coverley was elected a member of the council for many years, and he was for one year chairman.

Dr. P. Langdon-Down and Mr. M. Hainsworth, respectively chairman and surveyor of the Teddington Urban District Council, were on Monday authorised to obtain clerical assistance in the surveyor's office during the absence of Messrs. Firman & Tuffin, who have joined the Territorial Forces.

Mr. G. J. Griffiths, the chief engineer of the Thames Conservancy Board, who has been called up on active service, is, it was agreed on Monday, to be paid his full salary during the time he serves with the forces, "in view of the services he has rendered to the board in the past and of the extra expenses to which an officer in the forces is necessarily put."

Disinfecting Apparatus.—A correspondent asks for the names of makers of disinfecting apparatus.—Address "A," c/o The Editor.

Municipal Map of London.—A municipal map of London, prepared under the authority of the London County Council, is ready for publication. The map, the agents for which are Messrs. P. S. King & Son, is in sets of twenty-eight sheets, with a key sheet, and the price of the set is 31s. nett, separate sheets being sold at 1s. 3d. nett each. There is also an index to the map, the price of this being 2s. nett.

FOR OTHER ADVERTISEMENTS

See End of Paper.

COUNTY BOROUGH OF BOLTON.

The Corporation invite applications for the position of Junior Surveying Assistant, with municipal experience, in the Borough Engineer and Surveyor's Department.

Salary commencing at £65 per annum.

Applications, in candidate's own handwriting (endorsed "Junior Assistant"), stating age, qualifications and experience, together with copies of three testimonials of recent date, which will not be returned, to be delivered to the undersigned not later than Monday, the 26th instant.

Canvassing, directly or indirectly, will be considered a disqualification.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton.
October 14, 1914. (2,016)

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE.

The West Riding Highways Committee invite applications for the post of Assistant Surveyor in the office of the West Riding Surveyor.

Applicants must have had good practical experience in road construction, particularly in respect of the use of tar-macadam, tar-grouting, foundation work, road widenings, &c. A sound knowledge of surveying and levelling is also necessary, and, in addition, applicants must be neat and accurate draughtsmen.

Salary, £150 per annum.

The successful candidate will be required to devote the whole of his time to the duties of the office.

Applications (on form to be obtained from the undersigned), accompanied by not more than three recent testimonials, to be delivered at the office of the West Riding Surveyor not later than 10 a.m. on Monday, the 2nd of November, 1914.

Canvassing will disqualify.

F. G. CARPENTER,
West Riding Surveyor.

County Hall,
Wakefield.
October, 1914. (2,017)

DOCKING RURAL DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR OF HIGHWAYS.

The above Council invite applications for the post of Highway Surveyor for their Eastern District, comprising 19 Parishes, with 120 miles of Road.

The salary will be at the rate of £80 per annum, inclusive of travelling and other expenses (except books, stationery, and postages).

The person appointed will be required to give approved Security in the sum of £100 for the due performance of his office, and will be required to devote the whole of his time to the duties of the office.

Applicants must have a practical knowledge of Road Making and Maintenance, including Steam Rolling and the management of a Steam Roller, and of the duties appertaining to the office of Surveyor of Highways, and be able to keep the necessary books and accounts.

Applications, in candidate's own handwriting, stating age, qualifications, present occupation, and previous experience, accompanied by copies of three testimonials of recent date, must be delivered to the undersigned not later than Tuesday, October 27th, 1914.

Canvassing will be deemed a disqualification.

J. A. STOUGHTON,
Clerk.

Fakenham,
Norfolk.
October 14, 1914. (2,014)

COUNTY BOROUGH OF HUDDERSFIELD.
ENGINEERING AND SURVEYING ASSISTANT.

The Corporation invite applications for the appointment, in the Borough Engineer's Department, of a Temporary Engineering and Surveying Assistant, at a salary of £120 per annum.

The person appointed must be thoroughly qualified to fulfil the duties of the office, particulars of which may be obtained on application to the Borough Engineer.

Application, in candidate's own handwriting, giving full particulars as to experience, age, present and previous appointments, accompanied by not more than four recent testimonials, to be addressed to me, the undersigned, not later than ten a.m., the 28th October, 1914.

Canvassing will disqualify.

K. F. CAMPBELL, M.INST.C.E., M.I.E.E.,
Borough Engineer and Surveyor.

Huddersfield.
October 14, 1914. (2,015)

SHEFFIELD SEWAGE DISPOSAL SCHEME.

PROPOSALS FOR SECONDARY TREATMENT.

On Wednesday, the 7th inst., a proposal of the Sheffield Corporation to extend its sewage disposal work at a cost of £70,000 was the subject of a Local Government Board inquiry held by Mr. R. G. Hetherington, M.Inst.C.E., Secondary treatment of the sewage is proposed in order to keep the final effluent within the requirements of the West Riding Rivers Board, and to be in accord with the latest proposals of the Rivers Commission on Sewage Disposal.

Mr. C. F. Wike, M.Inst.C.E., the city engineer and surveyor, said the scheme prepared in 1904 was estimated at a cost of £270,000, now approaching completion. In spite of large expenditure on tanks and stable beds, it was found necessary to the sum of £262,000. Proceeding to describe the present scheme, Mr. Wike stated that experiments have been carried on for some time past, and that after full investigation it has been found that a complete treatment of the present effluent on a percolating filter, followed by settlement in humus tanks, gives entirely removes the suspended and suspended matters. The treatment at the rate of even 1,000 gallons per cubic yard has been found to be quite efficient, but the present proposal allows for a much less rate than that.

The proposals now submitted to the Local Government Board consist of: Pumping station, bridge over the river Don, main feed conduit, filter-beds, humus tanks, outfall culverts, roads, railways, and other ancillary works.

The pumping station will be erected on the west side of the river near the present primary effluent outfall culverts. Under the pump-house a pump-well will be constructed, and to this the effluent culverts from the contact beds will be connected. A modern pumping plant capable of lifting 45,000,000 gallons per day to the required height will be installed. The outfall culverts from the storm beds will also be connected to the pump-well, by means of culverts with penstock control, so that the effluents from these beds, when working as contact beds, can also be passed forward for secondary treatment. A bridge will be constructed to give access from the present cleansed area to the Holmes Farm estate. From the pump-well the effluent will be lifted into a 9-ft. conduit which will be carried over the river with the proposed bridge as one structure, and thence continued in a straight line on to and across the Holmes estate.

The percolating filter-beds will be situated south of the conduit and served by it, and will occupy an area of 9·07 acres, and be 6 ft. 3 in. deep with a maximum capacity for treating 45,000,000 gallons of effluent per day at the rate of 500 gallons per cubic yard of media. The floor will be constructed of concrete suitably graded, with the necessary effluent drains and channels, and the filtering media will be slag or clinker of large and medium grade. Provision has been made in the estimates for distributors for sprinkling the effluent over the media. On leaving the filter-beds the effluent will pass to the humus tanks by means of culverts as shown on the plan.

The humus tanks are six in number, with a total capacity of 2,500,000 gallons, equivalent to a four hours' flow when the dry-weather rate of 15,000,000 gallons per day is passing through the filter-beds. The tanks are similar in construction to the new settling tanks which are working so satisfactorily. A small pump-house will be provided at the end of the humus tanks for emptying the tanks and removing the humus which it is proposed to treat on the adjoining land. On its way from the tanks to the outfall the effluent will pass through a gauging chamber, where the quantity receiving secondary treatment will be registered. The necessary roads, railways and electric lighting of the site are provided for.

In laying out the scheme, special regard has been given to the development of the whole of the site, so that future extensions may be arranged and carried out in a uniform manner at the minimum cost; the main conduits will also be made large enough for this purpose. The levels have been so arranged as to ensure absence of flooding at the highest recorded rise of the river. Practically the whole of the works are designed to be constructed in brick and concrete.

The total estimated cost of the scheme as described is £70,000.

The filter-beds are designed for rectangular distributors, as such an arrangement occupies the minimum ground area and is least costly so far as the constructional work is concerned.

The scheme as now presented has been prepared after carefully reconsidering whether a gravitation scheme is possible.

The present proposal for secondary treatment provides 90,000 cub. yds. of filters. Experiments and [illegible] have shown that only a slight treatment is needed to ensure the primary effluents being brought well within the required standards, and extremely high rates of filtration have proved quite effective. It has, however, been considered desirable to provide ample accommodation. Taking the dry-weather flow of 13,500,000 gallons of real sewage, 1 cub. yd. for each 150 gallons is provided, or on the gauged flow of 15,000,000 gallons, 1 cub. yd. for each 166·6 gallons is available. In wet weather, taking three times the 10,000,000 gallons of domestic sewage and $1\frac{1}{6}$ times the 3,500,000 gallons of trade wastes, a total of 33,850,000 gallons per day must be dealt with; therefore 1 cub. yd. is provided for each 376 gallons, whereas the experiments have shown that more than twice this volume of primary effluent, even from the strong, dry-weather sewage, can be effectively dealt with. The humus tanks are also adequate, having a capacity of 2,500,000 gallons, or $\frac{1}{6}$th the gauged dry-weather flow, including the fresh and subsoil waters.

The city engineer is of opinion that the works proposed will amply serve the purpose required, and produce effluents in compliance with the most exacting requirements. At last week's inquiry, Dr. Wilson, for the West Riding Rivers Board, said they were quite convinced of the necessity for the works. Although in the winter the effect of the effluent on the river Don was not very marked, in the summer it caused an offensive nuisance. It was an excellent scheme, and would produce an excellent effluent.

SURVEYORS' INSTITUTION EXAMINATIONS.

After the examinations of March, 1915, a paper on the subject of "Heating and Ventilation" will be included in the Building and Quantities Section of the Intermediate Division.

Papers on the "Principles of Valuation and Use of Valuation Tables" will be included in the Final and Direct Fellowship Examinations, Sub-divisions I. and III. The paper on "Agricultural Chemistry" in the Final Examination, Sub-division I., will be dropped, and the scope of the paper on that subject in the Intermediate Examination will comprise Parts 1, 2, 3 and 4 of the existing syllabus.

The first ordinary general meeting of the session 1914-15 will be held on Monday, November 9th, when the president, Mr. Howard Chatfeild Clarke, will deliver an opening address. The chair will be taken at 8 o'clock.

Pudlo at Lewes.—The firm of civil engineers who have had the work in connection with the Lewes sewage works report that all experiments that they made with the powder Pudlo, for making cement waterproof, were perfectly successful.

London and Lancashire Fire Insurance Company.—The directors of the company have decided to pay, on the 2nd proximo, an interim dividend of 14s. per share, less Income-tax (as compared with last year's interim dividend of 12s. per share, less Income-tax).

Morris Double-speed Bottom-block.—Messrs. Herbert Morris, Limited, Empress Works, Loughborough, have brought to our notice an invention for speeding-up the lifting of loads on cranes and other lifting gears. This invention is a two-speed bottom chain block, which provides a fast speed for the quicker handling of loads up to half the capacity of the gear, while the heavier loads are lifted in the usual manner. The block is made with an attachment for linking on to the "live" side of the chain, which then takes the load up at double the normal speed. It can be adapted to practically any make of crane or travelling gear lifting on the double chain. In ordinary practice it is found that most loads are under half the capacity of the gear. Messrs. Morris' arrangement will therefore speed-up most of the work, and should save its cost many times over in a very short while.

STORES CONTRACTS.

EFFECT OF THE WAR.

[illegible] the contracts were entered into.

[illegible] full obligations under their contracts, and the committee [illegible] similar expenses, and in others they are unable to supply owing to the impossibility of obtaining further stocks, or for other reasons. In some of these cases the committee have terminated the contracts, and are obtaining supplies as and when required under special quotations pending the making of new contracts, and [illegible] tractors special arrangements which they think are equitable for dealing with the situation. Each case is considered on its merits, and any special arrangements made, of course, only apply to orders given after a new and serious condition of affairs not contemplated in the contract has actually arisen.

From time to time tenders or quotations for the supply of stores, &c., from firms controlled wholly or largely by persons of German or Austrian nationality have been accepted. After making the necessary inquiries in each case, the committee are arranging, if the facts justify that course, to have no further dealings with the firm in question.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

Meetings will be held at Newcastle on Saturday, November 7th, and December 12th.

B. Wyand,
39 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR'S ASSISTANT.—October 17th.—East and West Molesey Urban District Council. £80 per annum.—Mr. J. Stevenson, surveyor.

INSPECTOR OF NUISANCES.—October 20th.—Romford Urban District Council. £2 2s. per week.—Mr. C. T. King, clerk.

ENGINEERING ASSISTANT.—October 21st.—Neath Rural District Council. £90 per annum.—Mr. D. M. Davies, engineer.

TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.—October 21st.—Corporation of Bootle. 35s. per week.—Mr. B. J. Wolfenden, borough engineer and surveyor.

TEMPORARY ENGINEERING ASSISTANT.—October 22nd.—Corporation of Nottingham. £140 per annum.—Mr. Arthur Brown, city engineer.

SURVEYOR'S TEMPORARY ASSISTANT.—October 23rd.—Corporation of Salisbury. £150 per annum.—Mr. Francis Hodding, town clerk.

JUNIOR ENGINEERING AND SURVEYING ASSISTANT.—October 23rd.—Corporation of Newport (Mon.). £75—£104 per annum.—Mr. H. Tremelling, borough engineer.

CLERK OF WORKS.—October 23rd.—Corporation of Eccles. £150—£200 per annum.—Mr. E. Parker, town clerk.

TEMPORARY ASSISTANT SURVEYOR.—October [illegible] Dorset County Council. £150 per annum. Mr. E. A. Ffooks, clerk, County Offices, Dorchester.

CLERK OF WORKS.—October 24th.—Llandilo Rural and Amalgamated Rural District Councils.—Mr. T. M. Evans, clerk to the Joint Bridge Committee.

SURVEYOR.—October 24th.—Llandyssul Rural District Council.—Mr. J. [illegible], clerk, 12 Lincoln-street, Llandyssul.

SANITARY INSPECTORS.—October 26th.—Finsbury Borough Council. £150—£200 per annum.—Mr. G. W. Preston, town clerk, Town Hall, Rosebery-avenue, E.C.

ARCHITECTURAL ASSISTANT.—October 26th.—Corporation of Ealing. £2 10s. per week.—Mr. W. R. Hall, Town Hall.

SURVEYOR'S ASSISTANT.—October 27th.—Atherton Urban District Council. £2 per week.—Mr. William Garnett, clerk.

HOUSING INSPECTOR.—October 28th.—Scarborough Rural District Council. £80 per annum.—Mr. J. W. Read, clerk, 14 Dean-road, Scarborough.

TEMPORARY SURVEYOR AND INSPECTOR.—October 28th.—Swaffham Urban District Council.—Mr. Alfred J. Winter, clerk.

ASSISTANT SURVEYOR.—October 29th.—Antrim County Council. £125 per annum.—Mr. A. Millar, deputy secretary, County Court House, Belfast.

INSPECTORS.—October 31st.—Rhymney Valley Sewerage Board. £2 10s. to £3 per week. Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, S.W.; or Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

TEMPORARY ASSISTANT.—October 31st.—Somerset County Council. £3 3s. per week.—Mr. Edward Stead, county surveyor, Wells, Somerset.

INSPECTOR OF NUISANCES.—October 31st.—Cowbridge Rural District Council. £90 per annum.—Mr. J. Stockwood, clerk, Cowbridge, Glamorgan.

SEWAGE WORKS MANAGER.—November 10th.—Corporation of Dewsbury. £400 per annum.—Mr. H. Ellis, town clerk.

JUNIOR DRAUGHTSMAN AND SURVEYOR.—Derbyshire County Council. £80 per annum.—The County Surveyor, County Offices, Derby.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ST. HELENS.—October 31st.—Drawings of police buildings and fire station, for the St. Helens Corporation. Premiums, £100, £50, and £25.—Mr. A. W. Bradley, borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BEVERLEY.—October 17th.—For additions to lunatic asylum, for the Asylum Committee.—Mr. J. Bilson, architect, 23 Parliament-street, Hull.

LEICESTER.—October 17th.—For the supply and erection of steel plate girders and steel troughing, and the widening of Bow Bridge over the river Soar, for the corporation.—Borough Surveyor.

COSFORD.—October 17th.—For the construction of a brick tower, laying water mains, standpipes, valves, and other works, for the rural district council.—Mr. C. Dudley Bright, Polstead Heath, Polstead, Suffolk.

NORTHUMBERLAND.—October 17th—November 2nd.—For the erection of a school, for the Education Committee.—Mr. C. Williams, secretary, The Moothall, Newcastle-on-Tyne.

ERPINGHAM.—October 17th.—For making up a road, for the rural district council.—Mr. R. Mann, surveyor, Cromer-road, Holt, Norfolk.

GODSTONE.—October 17th.—For the erection of ten working-class dwellings, for the rural district council.—Mr. T. C. Barralet, surveyor.

BLACKBURN.—October 19th.—For the erection of a fire station and firemen's dwellings, for the corporation.—Mr. W. Stirrup, 14 Richmond-terrace.

SIDMOUTH.—October 19th.—For the erection of forty-eight cottages, for the urban district council.—Mr. R. W. Sampson, architect, Manor Offices, Sidmouth.

LONDON.—October 19th, November 2nd.—For the erection of new offices, for the Metropolitan Water Board.—Mr. H. Watkins, 13 Gray's-Inn-square, W.C.

SHEFFIELD.—October 19th.—For the enlargement of a school, for the Education Committee.—City Architect, Town Hall.

ROMFORD.—October 20th.—For the supply of 600 tons of granite, for the urban district council.—Mr. H. T. Ridge, surveyor.

SOUTHAMPTON.—October 20th.—For the construction of a covered reservoir, for the corporation.—Waterworks Engineer, 33 and 35 French-street, Southampton.

LONDON.—October 20th.—For the erection of buildings for motor lorries, for the county council.—Superintending Architect, County Hall, Spring-gardens, S.W.

SOUTHEND.—October 20th.—For works of improvement at the pier, for the corporation.—Mr. E. J. Elford, borough engineer.

LONDON.—October 20th.—For the extension of engine-house, boiler-house, coal store, and other works, for the county council.—Chief Engineer.

MANCHESTER.—October 21st.—For the restoration of the embankments of the Audenshaw reservoirs, for the corporation.—Messrs. G. H. Hill & Sons, Albert Chambers, Albert-square, Manchester.

HACKNEY.—October 22nd.—For the construction of a strong-room, for the borough council.—Mr. N. Scorgie, borough engineer and surveyor.

STOCKPORT.—October 22nd.—For the erection of a stable and cart shed, for the corporation.—Mr. J. Atkinson, borough surveyor.

SHEFFIELD.—October 22nd.—For the erection of public baths and wash-houses, for the corporation.—City Architect, Town Hall.

IPSWICH.—October 22nd.—For the erection of public health offices, for the corporation.—Mr. J. R. Mead, borough engineer and surveyor.

MANCHESTER.—October 22nd.—For wall and floor tiling, for the corporation.—The City Architect, Town Hall.

MERTON.—October 23rd.—For alterations to the council chamber, for the urban district council.—Mr. G. Jerram, surveyor.

SLIGO.—October 24th.—For the construction of a water supply, for the rural district council.—Mr. M. F. Conlon, clerk, Courthouse, Sligo.

FAVERSHAM.—October 24th.—For laying cast-iron pumping main, supply mains, with all necessary fittings, and the construction of a new reservoir, for the rural district council.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, London, S.W.

HAMPSHIRE.—October 26th.—For the extension of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

OYSTERMOUTH.—October 26th.—For the construction of reinforced-concrete service reservoir and filter tanks, for the urban district council.—Mr. W. P. Puddicombe, surveyor.

HASTINGS.—October 26th.—For the extension of a public convenience, for the corporation.—Mr. P. H. Palmer, borough engineer.

INVERNESS.—October 26th.—For the erection of a hall and other works at a school, for the School Board.—Mr. J. H. Gall, architect, Lombard-street.

WEST HAM.—October 27th.—For the extension of the asylum, Goodmayes, Essex, for the corporation.—Borough Engineer, Town Hall.

OLDHAM.—October 27th.—For the extension of a car shed, for the Tramways Committee.—Borough Surveyor.

ROXBURGH.—October 27th.—For widening and repairing a bridge, for the county council.—Mr. G. S. Carfrae, 1 Erskine-place, Edinburgh.

ILFORD.—October 27th.—For the erection of buildings and boundary wall, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

WOOD GREEN.—October 28th.—For the extension of caretaker's cottage, for the urban district council.—Mr. C. H. Croxford, architect to the Education Committee.

MANCHESTER.—October 28th.—For the erection of a laboratory, pump-room, and other works, for the Sanitary Committee.—City Architect, Town Hall.

HAWARDEN.—October 30th.—For the erection of a public convenience, for the rural district council.—Mr. L. F. Wilson, Westfield, Abermorddu, near Wrexham.

LUTON.—October 31st.—For the erection of eight cottages, for the rural district council.—Mr. H. Pickering, 18 Princes-street, Dunstable.

GREENWICH.—November 2nd.—For the erection of a dispensary, for the borough council.—Mr. A. Roberts, architect, 92 London-street, Greenwich.

WANDSWORTH.—November 3rd.—For the construction of underground conveniences, for the borough council.—Borough Engineer, 215 Balham High-road, S.W.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

SOUTHAMPTON.—October 20th.—For the supply of cast-iron pipes and special castings, for the corporation.—Waterworks Engineer, French-street.

LOWESTOFT.—October 24th.—For the supply of 2,483 yds. of 6-in. and 7-in. socket and spigot pipes, for the corporation.—Mr. G. H. Hamby, borough engineer.

LONDON.—October 30th.—For the erection of steelwork at gear store, for the Metropolitan Water Board.—Engineer, Savoy-court, Strand, W.C.

BUXTON.—For natural baths reconstruction, for the urban district council.—Mr. F. Langley, engineer and surveyor.

Roads.

HARROW.—October 17th.—For widening and surfacing, and laying out an open space, for the urban district council.—Mr. J. P. Bennetts, engineer and surveyor.

DEVONPORT.—October 17th.—For making up certain roads, for the corporation.—Mr. J. F. Burns, borough surveyor.

SALCOMBE.—October 20th.—For making up a certain road, for the urban district council.—Mr. G. I. Holmes, surveyor.

BRIGHTON.—October 20th.—For the supply of broken granite and flints, for the corporation.—Borough Surveyor.

TOTTENHAM.—October 20th.—For road widening and reconstruction, for the urban district council.—Mr. W. H. Prescott, engineer.

FLEET.—October 20th.—For the supply of macadam, shingle and hoggin, for the urban district council.—The Surveyor.

SHEERNESS.—October 20th.—For the supply of road materials, for the urban district council.—Mr. T. F. Berry, surveyor.

FELTHAM.—October 21st.—For the supply of granite, for the urban district council.—Mr. G. Stevens, surveyor.

DEAL.—October 22nd.—For the supply of Guernsey granite, for the corporation.—Mr. T. C. Golder, borough engineer and surveyor.

BRIDGEND.—October 23rd.—For making up back lanes, for the urban district council.—Mr. W. F. Tudor, surveyor.

CHELTENHAM.—October 24th.—For providing and laying complete, with concrete foundation, 1,500 square yards of creosoted deal block pavement, for the corporation.—Mr. J. S. Pickering, borough engineer.

WANDSWORTH.—October 26th.—For making up certain streets, for the borough council.—Mr. P. Dodd, borough engineer.

YORK.—October 26th.—For the construction of about 418 lin. yds. of new road, 50 ft. wide, for the corporation.—Mr. F. W. Spurr, city engineer.

RAWMARSH.—October 27th.—For making up a street, for the urban district council.—Mr. J. A. [illegible], surveyor.

KEIGHLEY.—October 27th.—For works of kerbing, channelling and flagging, for the rural district council. —Mr. Thomas Barber, surveyor.

GOSFORTH.—October 27th.—For making up certain streets, for the urban district council.—Mr. George N[illegible], surveyor.

SUTTON (Surrey).—October 28th.—For the supply of a [illegible] steam roller, which must be capable of being converted into a tractor, for the urban district council.—Mr. W. Hedley Grieves, engineer and surveyor.

NORTH DARLEY.—October 30th.—For the supply of [illegible] tons of gravel, on the urban district council. —Mr. E. F. Lowe, surveyor, Darley Dale, Matlock.

JOHANNESBURG.—October 30th.—For the supply and delivery of four tar-spraying machines, for the municipal council.—Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

WALMER.—October 31st.—For the supply of 500 cub. yds. of clean flints, for the urban district council. —Mr. W. Barker, surveyor.

SUNBURY-ON-THAMES. — November 2nd. — For road widening and reconstruction, for the urban district council.—Mr. H. F. Coales, engineer.

SOUTHALL-NORWOOD.—November 2nd.—For the supply of road materials, for the urban district council.—Mr. R. Brown, engineer and surveyor, Town Hall, Southall.

POULTON-LE-FYLDE. — November 7th. — For making up a street, for the urban district council.— Mr. J. B. Moss, surveyor.

WEST SUSSEX.—November 7th.—For the supply or hire of steam rollers, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

WEST SUSSEX.—November 7th.—For the supply of about 200,000 gallons of tar, for the county council.— Mr. H. W. Bowen, county surveyor, North-street, Horsham.

WEST SUSSEX.—November 7th.—For the supply of broken granite, quartzite, or other approved stone, chippings, tarred macadam, picked surface flints, pit flints, sand or binding material, cartage, and team labour, for the Roads and Bridges Committee.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

Sanitary.

DUNMOW.—October 17th.—For surface drainage work, for the rural district council.—Mr. A. E. Floyd, clerk.

ABERGELE.—October 17th.—For the construction of a stoneware sewer, for the urban district council.— The Surveyor.

ROMFORD.—October 17th.—For the construction of surface-water sewer and street works, for the rural district council.—Mr. W. J. Grant, surveyor.

LLANIDLOES.—October 19th.—For sewerage works and laying water main, for the corporation.—Mr. J. Grant, surveyor, Llanidloes.

MANCHESTER.—October 19th.—For the construction of main drainage work No. 8, East Didsbury intercepting sewer, for the corporation.—City Surveyor.

GLASGOW.—October 19th.—For the construction of pipe sewerage, for the corporation.—Office of Public Works, Town Hall, Govan.

NEWPORT (Mon.).—October 20th.—For the construction of 300 yds. of stoneware pipe sewer, for the corporation.—Borough Engineer.

SALCOMBE.—October 20th.—For the construction of a septic tank, for the urban district council.—Mr. G. I. Holmes, surveyor.

WELWYN.—October 21st.—For constructing sewer and manholes, for the rural district council.—Mr. T. E. Moore, surveyor.

LEEDS.—October 21st.—For the construction of three screening chambers, screening-house, three detritus pits, two mixing chambers, distribution chamber, four precipitation tanks, main gauging chamber, storm overflow culvert and outlet, 18 acres of bacteria beds, effluent channel and culverts and gauging chambers, and laying cast-iron feed mains, for the corporation.—Mr. Geo. A. Hart, sewerage engineer.

BALLIP.—October 24th.—For sewerage works, for the [illegible] Borough Surveyor.

READING.—October 27th.—For laying sewer and constructing manholes, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

LEYTON.—October 27th.—For the construction of a circular concrete tank, effluent channel, and inlet culverts at the sewage disposal works, for the urban district council.—Mr. Ernest H. Essex, engineer.

RHYMNEY.—November 3rd.—For the construction of main outfall sewer, for the Sewerage Board. —Messrs. Willcox & Raikes, 63 Temple-road, Birmingham.

EPSOM.—November 3rd.—For the construction of concrete tube storm relief sewer and other works, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

ROCHFORD.—November 9th.—For constructing about 2½ miles of glazed-stoneware and cast-iron pipe sewers, together with manholes and other works, for the rural district council.—Mr. A. C. Madge, surveyor.

EASINGTON.—November 10th.—For the construction of about 16,000 lin. yds. of stoneware and cast-iron pipe sewers, with manholes, flushing chambers, and other works connected therewith, for the rural district council.—Mr. G. Waterhouse, engineer.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.— "M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Miscellaneous.

CAERPHILLY.—October 26th.—For laying out three recreation grounds, for the urban district council.— Mr. Alfred O. Harpur, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ANDOVER.—For kerbing and paving works, for the corporation. Mr. R. W. Knapp, borough surveyor.

Bell & Co., Andover	£223
Beale & Sons, Andover	217
Bourne & Jenkinson, Andover	206

BILLERICAY.—For the construction of a pipe sewer and manholes, for the rural district council. Mr. R. J. W. Leyland, surveyor.

Harris Brothers, Billericay	£128
Moss & Newitt, Vange	122
W. Iles, Southend	115
W. Jackson, Forest Gate	113
W. Lingwood, junr., Romford	106

CARDIGAN.—For the erection of a school, for the County Education Committee.—Mr. G. Dickens-Lewis, county architect.

D. J. Rees, Blaenanerch, Cardiganshire	£1,795
James & Richards, Newcastle, Emlyn	1,720
George & Michael, Kilgerran R.S.O., Pembroke	1,696
W. Davies, Lakefield, Llanybyther	1,587
B. Jones, Sarnau, Henllan R.S.O.*	1,150

DEVIZES.—For the erection of six workmen's dwellings, for the rural district council.—Mr. T. V. Trumper:—

Blackford & Son, Calne	£1,598
Parsons Brothers, Westbury	1,435
G. Offer, Devizes	1,380
Waight & Oatley, Pewsey	1,333
J. Holloway & Son, Worton	1,293
L. Masten & Sons, Devizes	1,156

EDINBURGH.—Accepted for the supply of 400 tons of 9-in. dry sand cast-iron pipes, for the Water Trustees.—Messrs. J. & A. Leslie & Reid:—
Cochrane & Co., Limited, Middlesbrough-on-Tees.
Macfarlane, Strang & Co., Glasgow.

GRAYS THURROCK.—Accepted for the supply of 680 lin. yds. of wire fencing, with wrought-iron standards, and four wrought-iron field gates, for the urban district council.— Mr. A. C. James, surveyor:—
J. Elewell, Limited, Birmingham, £47.

HARPENDEN.—For the construction of about 1,400 ft. of 12-in. and 9-in. pipe sewers, for the urban district council. Mr. John H. Leverton, surveyor.

	Crossway	Manland avenue
H. & R. Hall	1,259	£311
A. C. Soan	206	263
F. W. Southorn	210	170
W. Deamer	178	176
H. Williams	169	156
C. W. Killingback	161	157
E. C. Jarvis	163	153
A. J. Powdrill †	140	142
Surveyor's estimate	[illegible]	[illegible]

LITTLEHAMPTON.—Accepted for the supply of granite chips, pit gravel, and hoggin; also steam rolling, for the urban district council:—H. Howard, surveyor.
Granite Chips.—Croft Granite Company, 2 in., 14s.; 1½ in., 14s.; ½ in., 13s.; ¼ in., 13s. 3d.
Shellicks.—J. Heaver, Chichester, 6s.
Hoggin.—J. Heaver, Chichester, 3s. 5d.
Steam Rolling.—J. L. Penfold & Co., Arundel, 26s.

LONDON.—For the supply of 240,000 creosoted deal paving blocks, 3 in. by 9 in. by 5 in., for the reconstruction of the tramways in Seven Sisters-road, for the county council:—

	Price per 1,000. £ s. d.
Millars' Timber & Trading Company, Limited, Commercial-road, E.C.	11 2 6
T. Gabriel, Sons & Burtons, Cannon-street, E.C.	11 0 0
Burt, Boulton & Haywood, Limited, Cannon-street, E.C.	10 17 6
Improved Wood Paving Company, Limited, Queen Victoria-street, E.C.	10 17 0
W. W. Howard, Brothers & Co., Trinity-square, E.C.	10 15 0
Acme Flooring & Paving Company (1904), Limited, Victoria Park, E.	10 13 9

LONDON.—For the repair of the carriageway of Hammersmith Bridge, for the county council:—

G. Wimpey & Co., Hammersmith, W.	£1,898
W. Griffiths & Co., Limited, Bishopsgate, E.C.	1,720
J. Mowlem & Co., Limited, Westminster, S.W.	1,709
Improved Wood Pavement Company, Limited, Queen Victoria-street, E.C.	1,663
Acme Flooring and Paving Company (1904), Limited, Victoria Park, N.E.	1,606

MACCLESFIELD.—For the construction of a surface-water sewer, for the corporation.—Mr. S. C. Baggott, borough surveyor:—

S. Bull, Macclesfield	£213
A. & S. Hyslop, Manchester	199
G. Roylance & Co., Limited, Macclesfield	173
W. H. Worthington, Limited, Manchester	163
G. Simpson & Co., Macclesfield	157
Gorton & Wilson, Macclesfield	148
Gosling & Stafford, Manchester	140

NEWPORT (Mon.).—For private street works, for the corporation.—Mr. H. Tremelling, borough engineer:—
St. John's-road (part of).—F. C. Parfitt, Harrow-road, £173.
Fields Park-avenue (parts 1 and 2).—J. H. Williams, £223 and £527.

ROMFORD.—For works of road improvement, for the urban district council.—Mr. H. T. Ridge, surveyor:—

W. Jackson, Forest Gate	£1,775
Davey & Armitage, Southend-on-Sea	1,690
T. W. Moss, Hornchurch	1,685
W. Manders & Co., Leyton	1,528
E. Free & Sons, Maidenhead	1,446
B. H. Hale, Hornchurch	1,419
Parlby & Bescoby, Romford	1,313

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

22.—Society of Architects: Mr. G. A. T. Middleton, A.R.I.B.A., on "Some Belgian Towns Affected by the War." 8 p.m.
29. Institution of Electrical Engineers: Sir John Snell, president, delivers his inaugural address. 8 p.m.

NOVEMBER.

4. Surveyors' Institution: Mr. H. Chatfeild Clarke, president, delivers his opening address. 8 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ATHERTON URBAN DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.

The above Council invite applications for the post of Temporary Assistant Surveyor. Candidates must have passed the Institution of C.E. Students, Surveyors' Institution, or Municipal and County Engineers' Examinations. The appointment will probably be until the termination of the War, at a commencing salary of £2 per week. Applications, stating age and experience, accompanied by three testimonials of recent date, and endorsed "Surveyor's Assistant," must reach the undersigned not later than Tuesday, the 27th instant. Canvassing, either directly or indirectly, will disqualify.

WILLIAM GARNETT,
Clerk to the Council.

Town Hall,
Atherton,
Near Manchester.
October 16, 1914. (2,006)

BOROUGH OF EALING.
ARCHITECTURAL ASSISTANT.

Required, in the Borough Surveyor's Office, a Temporary Architectural Assistant with good experience, for a period of not less than three months.

Age not to exceed 35. Candidates must be experienced in the preparation and finishing of architectural plans, and also in the working up of details. Salary, £2 10s. per week.

Applications, in candidate's own handwriting, endorsed "Architectural Assistant," stating age, qualifications, experience, past and present employment, accompanied by copies of not more than three recent testimonials, to be sent to me not later than Twelve (noon) on Monday, the 26th day of October, 1914.

W. R. HICKS, ASSOC.M.INST.C.E.,
Borough Engineer and Surveyor.

Town Hall,
Ealing, W.
October 9, 1914. (2,009)

COUNTY BOROUGH OF BOOTLE.
TEMPORARY ENGINEERING AND SURVEYING ASSISTANT.

Applications are invited by the above-named Council for the appointment of a Temporary Assistant in the Borough Engineer's Department. Applicants must be good draughtsmen, with a thorough knowledge of surveying and levelling, and preference will be given to one having had experience in a Municipal Office. Salary 35s. per week.

Applications, stating age, experience and qualifications, together with copies of three recent testimonials, and stating the earliest date on which the applicant can take up his duties if appointed, must be delivered to the undersigned on or before Wednesday, October 21st.

B. J. WOLFENDEN,
(1,999) Borough Engineer and Surveyor.

COUNTY BOROUGH OF NEWPORT.
JUNIOR ENGINEERING AND SURVEYING ASSISTANT.

Applications are invited for the post of Junior Engineering and Surveying Assistant in the Borough Engineer's Department, at a salary of £75 per annum, rising by annual increments of £10 to £104.

Applications, stating age, experience and qualifications, together with copies of not more than three recent testimonials, must reach me not later than 10 a.m. on Friday, October 23rd inst.

H. TREMELLING, ASSOC.M.INST.C.E.,
Borough Engineer.

Town Hall,
Newport, Mon.
October 10, 1914. (2,007)

URBAN DISTRICT COUNCIL OF SWAFFHAM, NORFOLK.
TEMPORARY APPOINTMENT
of
Surveyor, Inspector of Nuisances and Collector of Rates, or of
Surveyor and Inspector of Nuisances only.

Applications are invited for the above post. Applicants to state salary required per month, and when able to take up duties.

Applications and testimonials to be sent before the 28th October to—

ALFRED JOHN WINTER,
(2,005) Clerk to the Council.

COUNTY OF SOMERSET.

Temporary Assistant required. Must be experienced surveyor and leveller, able to carry out location survey for new road. Salary, three guineas per week. Applications, stating age, experience, and accompanied by testimonials, to be sent to the undersigned on or before Saturday, 31st October, 1914.

EDWARD STEAD, ASSOC.M.INST.C.E.,
County Surveyor.

Wells, Somerset. (2,008)

JUNIOR DRAUGHTSMAN AND SURVEYOR

(temporary) wanted at once. Engagement will probably last for the duration of the War. Salary at the rate of £80 per annum. Write full particulars of experience and references to the County Surveyor, County Offices, Derby. (2,010)

COUNTY BOROUGH OF DEWSBURY.

SEWAGE DISPOSAL WORKS

WORKS MANAGER.

[illegible] practical experience in the actual Construction of Sewage Disposal Works for the position of Manager of the Works to carry out by direct labour the Construction of Sewage Disposal Works at Mitchell Laithes, Dewsbury. Whole-time must be given. Staff found by Corporation. Salary at the rate of £400 per annum. Applications, endorsed "Works Manager," stating age, qualifications, and experience in Sewage Disposal Works Construction, with copies of three recent testimonials, to be sent in to the undersigned on or before the 10th of November next.

No one who has not had large experience as Constructural Works Manager of Sewage Disposal Works need apply.

H. ELLIS,
[illegible]

Town Hall, Dewsbury.
October 10, 1914. (1,998)

RHYMNEY VALLEY SEWERAGE BOARD.

RHYMNEY VALLEY SEWERAGE

CONTRACTS.

The Rhymney Valley Sewerage Board invite applications for the appointments of Inspectors in connection with the above Contracts, which comprise a Main Sewer, Storage Tanks (partly of Reinforced Concrete), Cast-iron Discharge Mains and Works on the foreshore of the Bristol Channel.

Salary from £2 10s. to £3 per week, according to qualifications.

Previous experience in the superintendence of work of a similar nature is essential, and full particulars of such experience, together with copies of recent testimonials, must be forwarded by the candidates with their applications, in envelopes endorsed "Rhymney Valley Sewerage, Inspectors," and addressed either to Messrs. Chatterton & Alford, 9 Victoria-street, Westminster; or to Messrs. Willcox & Raikes, MM.INST.C.E., 63 Temple-row, Birmingham, not later than October 31st, 1914.

T. J. THOMAS,
Clerk to the Board.

36 High-street,
Bargoed, Glam.
October 9, 1914. (1,996)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

METROPOLITAN BOROUGH OF GREENWICH.

TUBERCULOSIS DISPENSARY.

TO BUILDERS AND CONTRACTORS.

The Council of the Metropolitan Borough of Greenwich is prepared to receive Tenders for the Erection of a Tuberculosis Dispensary at Maze Hill, Greenwich, according to the Drawings, Specification and Conditions of Contract, which may be seen at the Office of the Architect, Mr. Alfred Roberts, F.R.I.B.A., 92 London-street, Greenwich, on and after Tuesday, 13th October instant, between the hours of 10 a.m. and 4 p.m. (on Saturday between 10 and 12). Those desirous of tendering may obtain copies of the Drawings and Specification from the Town Clerk, Town Hall, Greenwich-road, between the abovementioned times, upon payment of a deposit of Two Guineas, which will be returned to persons sending in a *bonâ-fide* Tender.

Tenders, on the Form to be supplied, sealed up and endorsed "Tender for Dispensary," must be delivered to the Town Clerk not later than 10 a.m. on Monday, 2nd November, 1914.

Tenderers will be required to sign a declaration that they pay such wages and observe such conditions as are considered fair in their trades.

The lowest or any Tender will not necessarily be accepted.

The Council reserve the right before a Tender is accepted of requiring the Tenderer to satisfy them or their Architect as to the nature and quality of work previously carried out by him.

FRANCIS ROBINSON,
Town Clerk.

Town Hall, Greenwich, S.E.
October 8, 1914. (1,992)

COUNTY OF WEST SUSSEX.

ROADS AND BRIDGES COMMITTEE.

TENDERS FOR MATERIALS AND CARTAGE.

The Roads and Bridges Committee are prepared to receive Tenders for the Supply of—

(1) Broken Granite, Quartzite, or other approved Stone and Chippings, also Tarred Macadam, to Harbours and to Railway Stations.

(2) Picked Surface Flints and Pit Flints, also Sand suitable for Surface Tar Treatment, or Binding Material, delivered on the Main Roads and to Railway Stations.

(3) Cartage from Railway Stations, Wharves and Stone Pits to Main Roads.

(4) Team Labour.

For the year ending 31st March, 1916.

Forms of Tender may be obtained on application to the undersigned, and applicants are requested to state which Form of Tender (1, 2, 3, or 4) they require.

Applications for Tender Forms should be accompanied by a stamped addressed foolscap envelope.

Sealed Tenders, endorsed "Tenders for Materials," or "Tenders for Cartage," to be delivered to the undersigned on or before 7th November, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

H. W. BOWEN, M.INST.C.E.,
County Surveyor.

County Surveyor's Office,
North-street,
Horsham. (2,003)

COUNTY OF WEST SUSSEX.

ROADS AND BRIDGES COMMITTEE.

TO STEAM ROLLER PROPRIETORS.

Tenders are invited for the Supply on Hire of Steam Rollers for work during the season ending 31st March, 1916.

Conditions of Contract and Forms of Tender may be obtained upon application to the undersigned, by whom Tenders, endorsed "Tender for Steam Rolling," must be received not later than 7th November, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

H. W. BOWEN, M.INST.C.E.,
County Surveyor.

North-street,
Horsham. (2,001)

COUNTY OF WEST SUSSEX.

ROADS AND BRIDGES COMMITTEE.

TENDERS FOR TAR FOR SURFACE TREATMENT.

The above Council invite Tenders for the Supply to the various Railway Stations within the County of about 200,000 gallons of Tar, in such quantities as directed, during the season ending the 31st March, 1916.

Persons tendering should give the following particulars: (*a*) Specific Gravity; (*b*) Percentage of Water, Ammonia, and Free Carbon; (*c*) Percentage of Tar produced in the manufacture of Carburetted Water Gas.

The Council does not bind itself to accept the lowest or any Tender, and reserves the right to accept Tenders for any portion of the quantity above stated.

Tenders, marked "Tar," must reach me on or before the 7th November, 1914.

H. W. BOWEN, M.INST.C.E.,
County Surveyor.

North-street,
Horsham. (2,002)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. OCTOBER 23, 1914. No. 1,188.

Minutes of Proceedings.

Extraordinary Traffic: Who is Liable?—(I.)

Few questions in connection with the subject of extraordinary traffic are more important than that of the incidence of the liability for the damage. And there are few which have been more frequently contested. The Highways and Locomotives Amendment Act, 1878, puts the liability on "any person by whose order" the traffic has been conducted. As a general rule there is no difficulty in the application of this designation to a builder or other contractor who has by himself or his servants carted materials in the fulfilment of a contract with another party. The difficulty has usually arisen when for any reason it has been thought that a judgment against the other party is more likely to prove fruitful than one against the contractor, and proceedings have accordingly been taken against the former. That difficulty has, it is true, been somewhat diminished since the passing of the Locomotives Act, 1898, by section 12 of which the words "by or in consequence of whose order" were substituted for the words "by whose order." But, as we shall see, the amended phrase has not altogether cleared the air. This enactment was the result of the decision of the House of Lords in the well-known case of *Kent County Council* v. *Lord Gerrard* (1897 A.C., 633). In that case Lord Gerrard invited and obtained tenders from various tradesmen to supply and deliver at his residence building materials of various kinds. No mode of delivery was specified, but as a matter of fact the only practicable method was (as Lord Gerrard knew) by traction engines. No contract was made for the supply by any one tradesman of a definite quantity of materials, but orders were given from time to time as occasion required to those tenderers whose samples and quotations were approved. It was held that Lord Gerrard was not liable for the extraordinary traffic caused by the carriage of the materials. Several of the Lords of Appeal pointed out that the words of the Act (of 1878) were "by whose order," and not "in consequence of whose order."

The amendment effected by the Act of 1898 was intended, of course, to meet similar cases, and, without relieving those who actually conducted the traffic, to impose liability also upon the person whose order set them in motion. And at first it was generally understood that this intention had been effectuated by the Act. But it was not long before the proverbial "coach and four" appeared in the case of *Egham Rural District Council* v. *Gordon* (1902, 2 K.B., 120). To the plain man the facts in that case would appear to be for all practical purposes on all fours with those in the Gerrard case. Mr. Gordon ordered a quantity of bricks from a brick company to be delivered at the site of a house which he was building. As in the Gerrard case, no mode of delivery was specified, and as in that case traction engines were used for the purpose. In short, it seemed precisely the case to meet which the clause was inserted in the Act of 1898. It must therefore have come somewhat as a shock to the council and their advisers when the County Court Judge decided that Mr. Gordon was not liable. "The traffic" (such in effect was the judgment) "was conducted not in consequence of any order given by the defendant, but in consequence of the brick company having thought fit to choose this particular method of delivery." The decision was affirmed by the Divisional Court, who seem to have been as much exercised to discover the true meaning of the phrase "in consequence of whose order" as the judges in earlier cases were in construing the words "by whose order." Mr. Justice Darling paraphrased "in consequence of" into "as a *necessary* consequence of," thus toning the clause down to fit the facts of the case under consideration. The learned judge, however, subsequently modified his opinion on this point, and adopted what we venture to think is a more reasonable interpretation, and one which has been approved by the Court of Appeal. We must, however, defer any further consideration of the question to a future occasion.

* * *

The Duty to Demolish.

The change of policy in regard to the closing and demolition of insanitary property which was effected by the passing of Part I. of the Housing, Town Planning, &c., Act, 1909, was principally directed to ensure more vigorous action on the part of the local authorities and to strengthen their hands in dealing effectively with an admitted evil. It will be remembered that under the

Housing of the Working Classes Act, 1890, a closing order had to be made by a court of summary jurisdiction upon a summons under the nuisance sections of the Public Health Act, 1875, and an appeal against the decision of the magistrates lay to Quarter Sessions. Further, a closing order having been made and not determined, the local authority were empowered to make a demolition order if they were of opinion that the dwelling-house in question had not been rendered fit for human habitation, and that the necessary steps were not being taken with all due diligence to render it so fit, and that its continuance was dangerous or injurious to the health of the public or of the neighbourhood. An appeal also lay to Quarter Sessions against a demolition order so made. Under the Act of 1909 this procedure was completely changed, and the duty of making both closing and demolition orders now rests upon the local authorities, an appeal lying against their decision, not to Quarter Sessions, but to the Local Government Board. Although the practical result of the new procedure has been to secure the closing, demolition, or improvement of a large amount of insanitary property, this has not been achieved without some legal battles of considerable importance. Our readers will, no doubt, call to mind the case of *Rex* v. *The Local Government Board (ex parte Arlidge)*, in which a property owner unsuccessfully attempted to challenge the procedure of the board in connection with the public local inquiries which are directed by the Act to be held prior to the dismissal of any appeal.

Another important question was decided in the High Court last week upon a case stated by the Local Government Board in the course of an appeal to them against certain demolition orders which had been made by the Burnley Corporation in the following circumstances. The Act provides in terms that, if the local authority are of opinion at the expiration of the prescribed period that a dwelling-house in respect of which a closing order has been made has not been rendered fit for human habitation, and that steps are not being taken to render it so fit, they *must* order its demolition. In the case under consideration, closing orders in respect of six houses had been made by the Burnley Corporation, and subsequently the houses had been sold for the purpose of converting them into warehouses. To this end certain internal alterations had been carried out, and there had been deposited plans from which it appeared that the owner intended to demolish the whole of the buildings save the external walls, and to convert the six dwelling-houses into two warehouses. Meanwhile, however, demolition orders had been made, and the plans were consequently disapproved on the ground that they showed an intention to retain and alter buildings which had been ordered to be demolished. In these circumstances the Local Government Board asked the opinion of the Court as to whether when a closing order has been made, and the local authority is satisfied either that there is no intention on the part of the owner to use the house as a dwelling-house, or that the house has been so altered as to become incapable of such use, the local authority is either entitled or bound to make a demolition order. To this the Court replied that a demolition order *must* be made under the Act. The apparent hardship of this decision was mitigated, however, by the answer given to a further question which was included in the case. The Act provides that on an appeal to the Local Government Board, the board may make such order in the matter as they think equitable, and it was held that, under this provision, they have power, in spite of the fact that the local authority are *bound* to make a demolition order, to quash or vary such order, or to make such other order as they may consider equitable in the circumstances of the particular case. It will be seen that the effect of this decision is to place very considerable power in the hands of the board, the wise exercise of which, however, will result in the mitigation of the hardship which would have resulted from a strict enforcement of the provisions of the Act.

* * *

Town Planning and Democracy. The establishment of a department of town planning in connection with the London University School of Architecture has already been noticed in these columns, and we now have to record its public inauguration on Thursday of last week, when Prof. Adshead, the chief of the department, delivered a most interesting lecture on "The Democratic View of Town Planning." There is nothing new under the sun, and town planning in one form or another has existed through the centuries. Starting with the primitive site planning of the ancients, its development may be traced through the axial approach planning, of which France affords such excellent examples, and the comprehensive estate development of the great landowners in the eighteenth century. The modern problem, however, is both different in character and wider in extent than that which confronted the town planner of former times, for it is concerned not only with the planning of cities and the development of estates so as to satisfy the landowner, but in securing that in future all the varying needs and interests of a complex democracy shall, as far as practicable, be satisfied. In this connection an account which Prof. Adshead gave of the growth of Oldham was of great interest. Originally, its development was due to a prolific water supply available for power production. The result was that in the days before by-laws it became rapidly overrun with mills and rows of cottages arranged with little regard for hygiene, and less for appearance. With the subsequent advent of by laws a new phase of development set in, and rows upon rows of stereotyped cottages made their appearance, so that not only the dwellings, but the very existence of the people became standardised. Thus, the town is a great example of sporadic growth under the ægis of an all-pervading industrialism. Latterly, however, a garden suburb has been laid out. Squalid blocks of insanitary property have been erased, and parks, playing fields, and children's playgrounds have been laid out in their place. Thus, once lovely glens, half-choked with the refuse of a century, have been opened out and reclaimed. Here is a capital illustration of the aims and objects of democratic town planning, and Prof. Adshead is to be congratulated upon the success with which, in his inaugural lecture, he struck a note which augurs well for the success of the department over which he presides.

* * *

The Erpingham Housing Loan. An economic problem in connection with the housing question, which raises a question of importance to small authorities, came this week before the Erpingham Rural District Council. The council in June last agreed with the Public Works Loans Board to a loan of £720 for the purchase of land and the building of four houses thereon. The erection of the houses has been nearly completed, and the council had announced their intention of taking up the loan. They have meanwhile received an announcement that the rate of interest has been advanced to 4 per cent. This means a further charge of 15s. per annum for each cottage, and at the end of sixty years an aggregate difference in the repayment of £178,

which is, it appears, equivalent to the original cost price of the house and garden. As the prospective tenants are too poor to pay what is termed an economic rent, the charge must perforce fall upon the rates. On being appealed to, the Local Government Board were unable to give the council anything but a poor comfort. They cannot regard the money as earmarked at the pre-war rate of 3½ per cent. because, as they explain, the matter is one for the Public Loan Commissioners and the Treasury to decide. These authorities will doubtless be appealed to in due course, and it is to be hoped that they will be able to come to the rescue of the council, though as to this there is, of course, no assurance that they will or can. All the same, such a state of things is disappointing and unsatisfactory, as it will tend obviously to retard cottage building in the rural districts, where the difficulties are already sufficient without being increased by financial dislocation.

* * *

Prevention of Unemployment.

A fund, the administration of which is in the hands of a sub-committee of the Architects' War Committee, has been started with the object of providing work for architects whose means of livelihood are practically stopped by the war. The sub-committee are occupied in evolving schemes of a useful nature by which those in distress may be temporarily employed, and in appealing for financial support from the architectural profession. Architects in actual need of employment in consequence of the war are invited to submit their cases to the honorary secretary at 28 Bedford-square, W.C. These cases will be considered by a sub-committee in strict confidence. Suggestions are invited for schemes of a useful nature by which architects may be temporarily employed. It is proposed, for instance, that small fees might be offered for measured drawings of buildings of architectural or historical interest, or for civic survey work. It is hoped to enlist the co-operation of architectural and other societies, so as to give effect to these proposals. An urgent appeal for help is made to those in sympathy. The fund in hand can only be regarded as a nucleus, and if the services to be rendered are to be as far reaching as it is hoped, a generous support must be forthcoming from all who realise the present opportunity as an exceptional one for undertaking such suggested work throughout the country. It should be made clear that the main object of the sub-committee is not to distribute benevolent aid, but to provide architects with temporary work of such a character that at the termination of the war their work would be of a distinct value to the community.

* * *

The Lowest Tender.

Whatever practical reasons can be advanced in favour of local authorities, who are using public money, accepting the lowest tender when making contracts, we believe we are right in saying that there is no legal obligation upon them to do so, even in the absence of the usual clause in the advertisement that "the council do not bind themselves to accept the lowest or any tender." The true view is that an advertisement asking for tenders is really an invitation to contractors to submit offers, and that no contract is completed until one of these offers—not necessarily the lowest—is accepted. Nevertheless, the acceptance of the lowest tender has come to be regarded as so usual that the adoption of any other course can only be justified by some sufficient reason. In letting a contract for drainage work, the Uckfield Urban District Council recently accepted a tender £73 in advance of the lowest, which amounted to £867, ostensibly because the accepted tender was from a local contractor. The specification contained a clause to the effect that local men were to be used wherever possible and in preference to imported labour, so that the interests of the local workmen were secured in any event. In this case it is difficult to see what justification there was for the action taken, as, if it was intended to place the contract locally, the competition should have been limited accordingly. In regard both to appointments and contracts we have always urged that applications should not be invited unless they are to receive *bonâ-fide* consideration.

* * *

Camp Sanitation.

In another column will be found the first of a series of articles on "Camp Sanitation" from the pen of Mr. G. Bertram Hartfree, the engineer and surveyor to the Alton Urban District Council, which we especially commend to the attention of those of our readers who may at any time be called upon to make provision of this nature for troops. In discharging such a task two considerations must be borne in mind. In the first place the interests of the users of the temporary conveniences and of the camp inhabitants must receive attention, and in the second place it must be seen that nothing is done which will be prejudicial to the public health of the neighbourhood. The latter danger arises specially in areas where there are users of underground water, which may become contaminated through percolation of foul matter mixed with rain. Every case must be governed by the local geological and other conditions, and it is evident that great service can be rendered by municipal engineers placing their local knowledge at the disposal of the military authorities. When large bodies of troops are billeted in public buildings, too, special sanitary arrangements are necessary, and in this connection interest attaches to Mr. Hartfree's statement that he is indebted to a detained alien enemy for the design of some ingenious emergency urinals, probably familiar to ship's plumbers. Too much attention cannot be given to these and similar matters, as upon them in large measure depends the health of the soldiers.

*

A Novel Exhibition.

It is some seventeen years since any substantial improvements were made in the equipment of the department of street cleaning of the city of New York, and now that the adoption of improved methods and appliances is to be undertaken, it is proposed to hold an exhibition with the threefold object of educating the inhabitants, giving manufacturers an opportunity of showing their wares, and providing facilities for practical tests and demonstrations. Among the matters which will be included in the exhibition are not only all kinds of brooms, brushes, sweeping machines, flushing machines, and other equipment used in street cleaning, but also household receptacles, transport vehicles and destructors. The idea is a novel and interesting one, and it is to be hoped that it may meet with a large measure of success. There can be little doubt that manufacturers will be quick to take advantage of the occasion to show their goods to the officials of the New York department, and at the same time to those of many neighbouring authorities, and if the general public can be induced to display any interest in the undertaking and be brought to some appreciation of the importance to the community of the work of a cleansing department, the exhibition will indeed not have been held in vain.

Camp Sanitation.

(1.)—LATRINES AND CLOSETS.

H. G. BERTRAM HARTREE, F.S.I., Engineer and Surveyor to the Alton Hants. Urban District Council.

[illegible] detected, as with soil misuse, needs more careful supervision than the latter. In addition, there is far more risk of pollution of underground water supplies from liquid than from solid filth.

While it is generally accepted that a trench is all-sufficient for temporary camps, there appears, in some areas at least, that, although there may be no danger [illegible] of the underground water may be a matter for serious consideration. Every case must be governed by local and geological factors, and consequently the advice [illegible] tage.

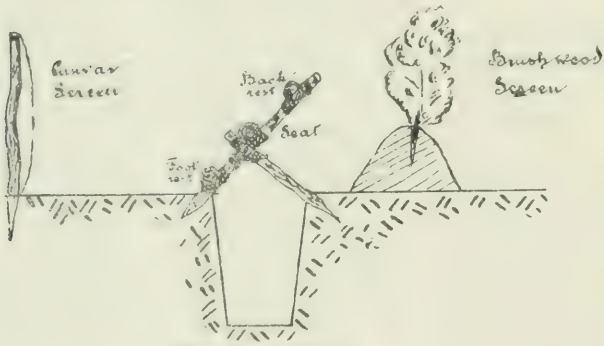
Several manuals advise that latrines should be about 100 yds. from the camps. While, however, this arrangement minimises nuisance at the camp from the latrine, it increases the possibility of the latter not being used, leading to consequent fouling of the ground around the tents. Unless very near, it may [illegible] visited at night, with results which can readily be imagined. It is desirable that day latrines should be the greatest distance away—within reason, of course—and that for night use a sufficiency of suitable receptacles should be available. There is an objection to the ordinary water pail or bucket, which, unless legibly branded to ensure its being kept solely for this use, may serve a dual purpose. Safer utensils are the small-pattern galvanised bins commonly provided for house refuse, or the galvanised pails of similar type to those used in earth-closets. Should the foregoing not be obtainable, any non-absorbent article will suffice; but, if possible, materials that can easily be removed should be provided, and every care taken to reduce to zero the possibility of spilling or splashing.

For day latrines a shallow trench is suggested for rest camps. For longer periods than twenty-four hours, a depth of from 3 ft. to 6 ft. is advised, and the width should average 2 ft. 6 in.

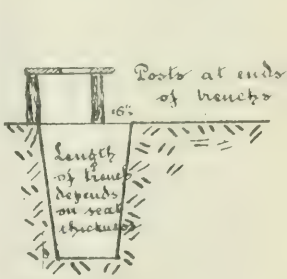
A point for controversy is whether the width should be greater at top or bottom, it being claimed in favour of the latter that by undercutting the sides are protected from fouling. The advantage is doubtful; in addition there is the risk of unsupported earth giving way, and sacrificing the man to save the earth sides. The safer course is to allow a width of 3 ft. at top and 2 ft. at bottom.

When setting out an ordinary latrine, it is usual to allow 1 lin. ft. for seven men. Scaffold poles are the usual substitutes for seats, but to the uninitiated this system leaves much to be desired. However, practice leads to perfection. A great improvement [illegible] The height of the seat pole should be 18 in. off the ground, with its centre not exceeding 1 ft. from the inside edge of the trench, 3 ft. in width. The best position for the back-rest is 18 in. above the seat, and a pole at or near the ground line is desirable. The latter is usually described as the foot-rest, and if not required for that purpose, is an advantage, in some measure at least, in performing one of the duties of the risers supplied to ancient privies. Should portable seats be provided in lengths, but otherwise of orthodox shape, it is advisable that their front edges should set back a distance of 6 in. beyond the front of the trench, thus reducing the possibility of the ground surface becoming urine sodden.

The usual practice is to cover the contents of trench latrines with dry earth at least once daily. When necessary, fill in with the excavated earth, and dig new trenches. At a camp that I am supervising I was compelled, owing to the nature of the subsoil, to adopt a different system. The top earth is clay and loam, but below the upper chalk exists. In consequence, trenches were dug in the top earth, and the contents covered with quicklime daily. The fæcal matter, which was received in iron troughs, was removed to a site 200 yds. from the camp. Here it was deposited on a thick layer of lime, and spread in alternate layers of soil to earth or ashes. An improved system of receptacle has now been adopted, owing to the continuation of the camp, but the disposal is unchanged and quite satisfactory. When sufficiently decomposed, the contents of the heap will be used as a surface manure.



Pole Seat Latrine



Ordinary Seat

A difficulty met in billeting is the sanitation for large halls, the closets for which are insufficient for large numbers of residents. Some twelve months back I fitted up a drill hall for the use of a double company by providing Moules' earth-closets and a plentiful supply of dry ashes. If obtainable, dried earth, peat, moss litter, and other similar material is, naturally, better than ashes. Authorities advise that sun-drying is preferable to artificial heat, as the latter kills the micro-organisms that assist in the work of excreta disposal. For urine, the various receptacles mentioned for night use in open camps would be suitable. I am indebted to a detained "alien enemy" for the design of some ingenious emergency urinals, probably familiar to ships' plumbers. The general idea follows the stoneware basin-shaped urinals, with a high back and sides, rounded fronts, dished base, and an outlet at bottom, the whole being neatly constructed of zinc, with clean-soldered joints. I approved their use as an experiment, subject to their being fixed in a position that allowed easy and frequent removal for cleansing, and the waste pipe being taken outdoors to discharge into a galvanised-iron pail.

All receptacles used for camp sanitation should be frequently emptied, and limewashed before being re-

barrel for use. Wherever possible liquids should be poured down a fully leading to a public sewer.

When camps are intended for long occupation more permanent offices are required. Floors of concrete, laid to suitable falls, are necessary; the roofs may be covered by galvanised iron. Timbered sides covered with iron have the disadvantage that innumerable crevices are formed, but Brother John of the Order of St. Paul (whose abbey at Alton is now used as a concentration camp for alien enemy seamen) has solved this difficulty by erecting a timber framing and fixing the galvanised iron inside. The sides of the closets are better if they are 6 in. short at top and bottom to allow of effective ventilation. Internal partitions are not required, and a screen at the entrance is preferable to a door. Urinals for temporary camps required for long periods may be constructed with concrete floors and galvanised-iron sides and backs, the timbers being on the outside of the iron. Liquids should gather to a main channel leading to a trapped gulley, the drain of which discharges on to a suitable disposal site. The constant use of quicklime or chloride of lime in camp sanitary offices is [illegible] necessary.

WORCESTERSHIRE ROADS.

COUNTY SURVEYOR'S REPORT.

In his report for the year 1913-14, Mr. C. F. Gettings, county surveyor of Worcestershire, gives expression to a feeling of relief that in the near future some considerable assistance from the Exchequer Funds may be looked for, as undoubtedly the limit has been reached as regards the county contribution towards the cost of maintenance of trunk roads, which have now become more or less a national liability.

Surface tar-painting was extended in the county during the year, some 60 miles being treated at a cost of £3,153. Dehydrated tar was used, and all work was carried out by the county staff. It was an excellent season for this class of work, and the results obtained thoroughly justified the expenditure. The committee appreciated this fact, as there was no hesitation in agreeing to increase the estimate for similar work for the current year to £4,800. "Apart from the question of comfort to residents and users, there is no doubt," remarks Mr. Gettings, "that the life of all roads that take fast light motor traffic has been considerably extended."

Owing to the delays experienced last year in obtaining plentiful supplies of grit, a quantity of this material was purchased during last winter for the current year. Some difficulties have been experienced in obtaining supplies of materials—especially tar-macadam—but Mr. Gettings believes the merchants have done their best, having regard to the increased demand for this material.

Considerable trouble has been experienced in obtaining manual labour, and for certain classes of work it has frequently been necessary to import men in order to get the work carried out expeditiously.

The report mentions that a new bridge was built at Defford, and Upton Snodsbury Bridge was widened and strengthened, in addition to which considerable repairs were carried out to various other bridges in the county.

URBAN MAIN ROADS.

Frequent inspections have been made of the whole of the main roads in the municipal boroughs and urban districts. In several cases the roads have got into a weak condition in consequence of the increasing heavy traffic. The county surveyor does not consider it economical to continue to repair many of these roads with ordinary water-bound macadam, and some approved bituminous surface should, in his opinion, be substituted. In the majority of the districts, where the surface of the road is not tar-macadam, it has been tar-painted, and in several of these cases Mr. Gettings considers that street watering is done to an excessive extent and to the detriment of the tar surface.

The increasing expenditure in urban districts has previously been referred to by the county surveyor, and he is afraid that further increases must be anticipated until the whole of the urban authorities have brought their roads up to a standard that is necessary for the present-day traffic.

ROAD BOARD SCHEME.

The scheme for strengthening, widening and surfacing with bituminous-bound material about 53½ miles of main roads, at an estimated expenditure of £127,000, was commenced in May, 1913, following approval by the Road Board.

Good progress was made during the summer of that year, and in consequence of the favourable winter the work was not held up to any extent, so that it was found possible to complete the proportion of work provided for. During the current year a similar rate of progress has been maintained, and at the present time some 14 miles of roads have been completed.

"To anyone who is not acquainted with the conditions under which we are working, the rate of progress may, perhaps," Mr. Gettings observes, "appear to be slow; but when it is considered that we are not only having to widen the roads in the majority of cases, but strengthen every road the full width, it will be seen that a large tonnage of materials is required. It may be interesting to know that for every mile of road reconstructed about 2,400 tons of foundation materials and 1,550 tons of surface materials are used. The committee are aware that I hold very strong views as to the necessity for having a first-class foundation before applying an improved surface, as, although I appreciate it is expensive in the initial outlay, the results will lead to economy."

In connection with the scheme referred to, the committee decided to lay a few trial sections constructed with various surface materials on the Worcester and Droitwich road. It is just over a year since these were completed.

TRIAL SECTIONS.

The site chosen is on the Worcester and Droitwich main road at Perdiswell, and the first length commences at the Worcester city boundary. The road is very nearly level and straight, has an open situation and is well drained, but is not kerbed on either side.

From the census returns taken in July, the average daily traffic amounted to about 825 tons per day, which is an increase of 176 tons per day compared with returns taken twelve months ago.

There are seven sections, each about 150 yds. in length, the total length being 1,096 yds. The road is about 20 ft. wide, and the superficial area is 7,446 sq. yds.

Previous to reconstruction the road averaged 18 ft. in width, and the surface consisted of a very thin coat of Clee Hill granite laid on a subcrust of gravel. The old road was left undisturbed, and the sides widened out to give the present width of 20 ft. A trench about 2 ft. wide and 9 in. deep was excavated along each side of the road, and filled in with 6-in. broken slag. These sides were rolled, and then the foundation coat of 3-in. to 4-in. slag was laid throughout, and consolidated to a thickness of 5 in. by a 12-ton roller. The various kinds of surfacing materials were laid to a depth of from 3 in. to 3½ in. when consolidated, and rolled by an 8-ton roller, except in the pitch-grouted section, on which a 12-ton roller was employed. Both the foundation and the surface coats were laid half the width of the roadway at a time, but only in short lengths, and the traffic was kept going without interruption during the progress of the work. The whole of the work was carried out by the county council's own staff, and all the various kinds of tar-macadam were laid by the same gang of men to ensure uniformity of work. All the sections were tar-painted during June, 1914, and in nearly all cases the tar-painting had a beneficial effect, particularly in sealing the surface layer, and in preventing this from breaking up.

A Surveyor Recovers Damages for Assault.—The surveyor to the Swansea Rural District Council, Mr. Gabriel T. Powell, was awarded £5 damages on Monday in an action in the Swansea County Court against a firm of ironmongers at Pontardulais. In the discharge of his duty Mr. Powell was engaged in dealing with a plot of land about which there had been dispute when defendants squirted black varnish on his face, his eyes being affected for a fortnight and his clothes damaged.

Newcastle's "Troglodyte Habitations."—In his annual report the medical officer of health of Newcastle-upon-Tyne, Dr. Harold Kerr, expresses a hope that very soon the city will be entirely freed from the troglodyte habitations on the quayside. It is certain, he says, that houses at present self-contained, with basement kitchens, will have to be strictly watched against their being let off as tenements with inhabited cellars. Unfortunately, the law gives no power to interdict their use at present, although servant girls may be compelled to pass the greater part of their daily lives below ground.

The Functions of a Municipal Engineer.

By Prof. E. R. MATTHEWS, [illegible] Chadwick Professor of Municipal Engineering in the University of London.

[Prof. Matthews has now taken up his new duties at University College, where on Monday last before a gathering presided over by Sir William J. Collins and including the Provost of the University, Dr. Gregory Foster, he delivered the first of a series of three public lectures. The Dean of the University, Prof. E. G. Coker, D.Sc., M.Inst.C.E., in introducing Prof. Matthews, remarked that the latter, for sixteen years borough engineer of Bridlington, had already won his spurs in the municipal engineering world. Prof. Matthews' second lecture, which will deal with the subject of Refuse Disposal, will be given on Monday next at 5.30, and his third lecture, on Reinforced Concrete in Municipal Engineering Works, on the following Monday, at the same time. Admission on both occasions is free.]

[illegible] that connected with municipal work, and the position of engineer to a corporation is becoming more responsible every year. There are in England and Wales 25,000 local authorities, and most of these have already spent vast sums of money on public works under existing Public Health and other Acts. The Local Government Board for some years past have sanctioned borrowing to the extent of about £14,000,000 annually. In addition to this there are the loans which are obtained by means of Acts of Parliament.

The present amount of outstanding loans for which local authorities are responsible is about £500,000,000, and most of this is for municipal engineering works. It will therefore be obvious that the appointment of an engineer to a local authority is no small matter, for it will devolve upon him in most cases to spend, wisely or unwisely, large sums of the ratepayers' money, and the need that he should be a well-trained engineer must be very apparent.

SECURITY OF TENURE.

Not only so, but I believe the time is fast approaching when the municipal engineer will be an official who will reap the advantages of a pension, and who will be given "security of tenure" by the Government. On the other hand, the time has arrived when no one should be allowed to hold an appointment as municipal engineer to a corporation (who has not hitherto done so) unless he can show that he has had a theoretical training as well as practical experience. It is the purpose of the Engineering Department of this University to give such training. In addition, we are hoping to train many students for municipal appointments (engineering assistants) in the Colonies, in India, Japan, China, and other countries.

INCREASING DUTIES.

New legislation is imposing fresh duties upon a municipal corporation, so that the duties of their engineer are increasing rapidly, and his position is therefore growing in responsibility. Every town of any importance has its own waterworks, sewage works, and tramways, while many corporations own the gas and electricity undertakings, the public baths, and in some cases the golf course, and even places of entertainment.

PROTECTION OF COAST TOWNS.

In coast towns the protection of the town against the inroads of the sea is a matter which has to be dealt with by many corporations, and very often costly protection works have to be put down. At Bridlington, for example, over £70,000 has been spent by the town in protecting and improving about 1 mile of the north foreshore, and the repayment of the principal and interest represents a 9d. rate, while at Filey, 12 miles further north, the coast protection works have involved the town in a 1s. 3d. rate. The Hastings Corporation have spent huge sums of money in protecting their town, while at Brighton an average of £2,500 has been spent annually for a number of years in sea defence works. Scarborough has also carried out a good deal of protection work, costing many thousands of pounds. Not only have large sums of money to be spent in protecting coast towns against the inroads by the sea, but huge sums have to be spent in the carrying out of sea front improvement works. I have been called upon, for example, to design and carry out at Bridlington sea front improvement works costing £40,000, and it has been my duty quite recently to design further improvement works which are to cost £50,000, and which will be proceeded with when the war is over.

Coast authorities have, however, this advantage, that (generally speaking) they are saved the cost of constructing expensive sewage disposal works, as the sewage is discharged, after passing through screen chambers, direct into the sea, either at high water and the commencement of ebb, or at all states of the tide.

In the engineering course at this University the actual designing of sea walls and other forms of sea defences will be ably dealt with by my experienced colleague Mr. A. T. Walmisley, M.Inst.C.E., of the Dover Harbour Works.

CHIEF DUTIES OF A MUNICIPALITY.

Whether coast or inland town, the chief duties of a [illegible] are:—

(1) To supply pure water for the use of its inhabitants.

(2) To provide a proper sewerage system with sewage disposal works.

(3) To construct suitable streets and highways, and to maintain these.

(4) In many towns to put down and maintain a tramway system.

(5) To adopt a proper method of collecting and disposing of house refuse.

(6) To establish a satisfactory system of street lighting.

The borough engineer of a town has many other duties to perform besides those coming under these six headings, such, for instance, as the making up, so that the corporation may take over, of private streets, tree planting in streets, the construction of highway depots and municipal workshops, the building of stables and public conveniences, the designing and erecting of sanatoria, the laying out of corporation estates and of cemeteries, and the carrying out of cemetery extensions, the designing and erecting of council schools, the supervising of the street cleansing department, the erection of fire stations, markets, public slaughter-houses, public wash-houses, swimming and other baths, the designing and erecting of electricity works and waterworks pumping stations, the demolition of insanitary areas, the erection of workmen's houses, the laying out of parks, gardens, and recreation grounds, the erection of public shelters, the preparing of schemes for the widening of existing narrow streets, the reporting on building plans sent in as to whether these are in accordance with the by-laws, the control of indoor and outdoor staffs, the latter usually including inspectors, foremen, and workmen—these are some of his many duties.

As to the preparation of plans, it is his duty to prepare for the corporation plans, specifications, estimates, and quantities for most, if not all, of the engineering works which the corporation may require from time to time, also Parliamentary plans with book of reference, and to supervise the carrying out of these works; he will also frequently be required to write reports, and it will be his duty to give evidence at all Local Government Board and other inquiries.

In addition to these and many other duties which he has to perform, the municipal engineer has now to prepare for his corporation town planning schemes, and in preparing these he must be able to look ahead, chiefly from an engineering point of view, and to anticipate the requirements of the town, say, twenty to thirty years hence. He will therefore have to be a man who dreams dreams and sees visions. But, in preparing a town planning scheme, I certainly think that he should work in conjunction with an architect, for, after all, town planning is more of an architectural matter than an engineering. The Institution of Municipal and County Engineers have recently decided to grant a certificate or diploma in "Town

Planning," which is to be obtained by examination. This is a step in the right direction, as is the establishment of a town planning department in connection with the Architectural Department of this University. I hope that municipal engineers who are appointing assistants will give preference to those who hold certificates in this subject.

The introduction of reinforced concrete in engineering constructions makes it very necessary that he shall be acquainted with this material, and understand how to calculate the strength of it under various conditions, and this information, which has been so ably imparted in the "Civil and Mechanical Engineering Department" by my friend Prof. Cormack, will now be dealt with by Prof. E. G. Coker, D.SC., M.INST.C.E. I intend in my third public lecture to deal with the use of reinforced concrete in municipal engineering works, and to refer to its use in reservoir construction later in the present lecture.

It is also extremely necessary that the municipal engineer should have a thorough knowledge of building construction, for while he must not claim to be an architect—for that is not his profession, and my experience has been that the man who is a good architect is a poor engineer—nevertheless, he will usually be responsible (out of London) for the inspection of new buildings. He will often have to advise his council as to whether or not a rolled steel joist of a certain section will be sufficiently strong to carry a wall that is to rest upon it, or upon some other equally important point, and it will frequently happen that he will have to settle a dispute between an architect and a contractor relative to the strength of some part of a structure, and so "Building Construction" has been included as one of the optional subjects in the Engineering Department of the University. I strongly advise all municipal engineering students to take this. Every civil engineer should be an expert in surveying and levelling, and in the engineering course of this University this subject is dealt with in an able manner by my colleague Mr. Ormsby. I know of no one better qualified to deal with the subject.

CHIEF DUTIES OF MUNICIPAL ENGINEERS.

It will be quite impossible for us to-night to deal with the manifold phases of a municipal engineer's work, which I have named. We will therefore confine our attention to the six chief duties of a municipality as already set out, and discuss two or three matters which come under one or other of these heads.

These subjects will be fully dealt with in the Municipal Engineering Course in this University, when I hope to illustrate by means of diagrams the various methods of construction adopted both in this and other countries. I propose to make the course as practical as possible, and at the same time to give the students a thorough grounding in the principles involved, so that they will turn out in every way capable assistants to a municipal engineer. I intend to deal with the latest methods of sewage disposal, the construction of sewers in bad ground and under exceptionally difficult conditions, and generally to be as up to date as possible in methods of construction. There is a great need at the present time for well-trained road engineers and surveyors; the course will therefore include a number of lectures on this important subject, which should be of great value to those who are intending to enter that branch of the profession, whether at home or abroad. I am also dealing with "Town Planning from an Engineering Aspect." The rebuilding of the cities in Belgium and the North of France which have been so ruthlessly destroyed by the Germans will soon take place, and the cost of doing so will be debited to the account of the intruder. What that bill will amount to I dare not think, and while we can never replace the old, with which some of us are so familiar, nevertheless there will rise up from the ruins of the old cities, new ones, laid out on modern lines, with wider avenues and more perfect sanitary conditions, and the municipal engineer will be the man whose services will be required in this connection. His knowledge of town planning and sanitation will be of immense value to those who will seek his services.

I now propose to draw your attention to one or two matters which, at the present time, should occupy the special attention of the municipal engineer. The first of these is the use of

MOTOR VEHICLES IN MUNICIPAL WORK.

It is the duty of every borough engineer to carefully consider where he can save by the use of motor instead of horse-drawn vehicles. In some towns such vehicles are in use for street-watering purposes; in other towns they are used for street sweeping, and in some they are employed in the collection of the town's refuse. For all of these purposes, with the exception of the latter, they are admirable, and I believe a saving can be effected. I do not, however, consider that they are suitable for the collection of house refuse. Then the engineer must choose between petrol, electric, and steam driven vehicles. The choice will depend entirely, of course, on the work the vehicle has to do. It may be that it is required to do a variety of work, or it may be needed to perform the same task daily, or speed may be the chief consideration — to keep work going at wide distances.

Mr. Hugh Miller, in an interesting series of articles on this subject which recently appeared in the *Sanitary Record*, has set out in tabular form the cost of running a motor vehicle, and assuming the vehicle to be capable of doing 125,000 miles, and of carrying a load of 2 tons, and that it cost £475, the cost of tyres being £85, then in the following table is set out the cost of running and upkeep.

—	Miles per day.	
	40	60
	s. d.	s. d.
Interest on capital, 5 per cent	1 7	1 7
Depreciation	3 0	4 6
Insurance	1 0	1 0
Rent	0 6	0 6
Tyres	6 8	10 0
Driver's wages	6 0	6 0
Oil	0 8	0 11
Petrol (10 miles per gallon at 1s. 6d.) ..	6 0	9 0
Repairs	2 0	2 6
Total cost per day	27 5	36 0

If a 4-ton motor van be used instead of a 2-ton, the cost of running would be as follows:—

4-TON MOTOR VAN, £650. COST OF TYRES, £125.

—	Miles per day.	
	40	60
	s. d.	s. d.
Interest on capital, 5 per cent	2 2	2 2
Depreciation	4 2	6 3
Insurance	1 0	1 0
Rent, &c.	0 6	0 6
Tyres	10 0	15 0
Driver's wages	6 0	6 0
Oil	0 8	1 0
Petrol (6½ miles per gallon at 1s. 6d.) ... ... (This is not the war price probably .	9 2	13 9
Repairs	3 0	4 6
Total cost per day	36 8	50 2

It would appear from these figures that a saving can be effected by the use of the motor vehicle.

Among the electric motor vehicles suitable for municipal work might be mentioned the "Fram" vehicle, as used by the municipality of Paris, Havre, and Nancy. The outstanding feature of this vehicle is its simplicity, and the fact that the whole of the driving mechanism is contained on the forecarriage, which is thus a self-contained driving unit.

On the Continent "Fram" wagons have been brought to a very high state of mechanical and electrical efficiency, and there are to-day in use in Paris working for the municipality over 100 5-ton wagons. These are in use for dust collecting and other municipal purposes. The Paris "Frams" are fitted with special metal tank bodies, which are carried low down so that the loading line is only 4 ft. 7 in. from the ground level. This low loading line is only possible owing to the fact that there is no driving mechanism whatever on the chassis.

There are many advantages attached to the front drive, and for work calling for the wagon to run alongside the kerb; the front drive enables the vehicle to draw out even on a slippery, steeply cambered surface without slipping or skidding, which very often takes place with rear-driven wagons.

The "Fram" wagons appear to be easy to drive, and the simplicity of the driving mechanism ensures that the cost of maintenance is reduced to a minimum.

The chief cost is the upkeep of the battery, but as regards this the makers should be prepared to enter into a maintenance contract; the cost to be incurred in this respect would therefore be ascertained. For short-distance heavy carting work, entailing many stops, a wagon of this type is very suitable, and will probably be found to be less expensive than petrol and steam wagons engaged upon this class of work. Of course, any type of body—such as a plain platform, a lorry body with falling detachable sides, or a dust-wagon body—can equally well be supplied and fitted to motor vehicles, or bodies can be made to tip either by mechanism operated by hand or by electric motor if desired.

(To be concluded.)

Welsh Housing Conditions.—The council of the Welsh Housing Association, at their meeting recently, adopted the following resolution on the motion of the president, Lady Boston: "That the council of the Welsh Housing Association is of opinion that the conditions of housing of the working population throughout the urban and rural districts of Wales and Monmouthshire are of so deplorable a nature, and the necessity for reform on a large scale is of such imperative importance, that the appointment of a central Welsh housing authority appears to be the only action likely to prove effective for solving the problems involved."

Road Surfacing in the East.—It is pleasing to note, says the *Ceylon Observer*, how Colombo roads are being systematically oiled, and dust nuisances appreciably allayed week by week. Similarly Hongkong has been experimenting with various methods of tarmac for road surfacing. The Russian Municipal Council in Hankow are busy laying a long stretch of tar-macadam road. They have also tried to sprinkle the roads with absorbitant soda which, absorbing the moisture from the air, keeps the road damp and dustless. The British Municipal Council are engaged in covering a part of one road with crude petroleum, a method adopted with a good deal of success in Singapore as in Colombo.

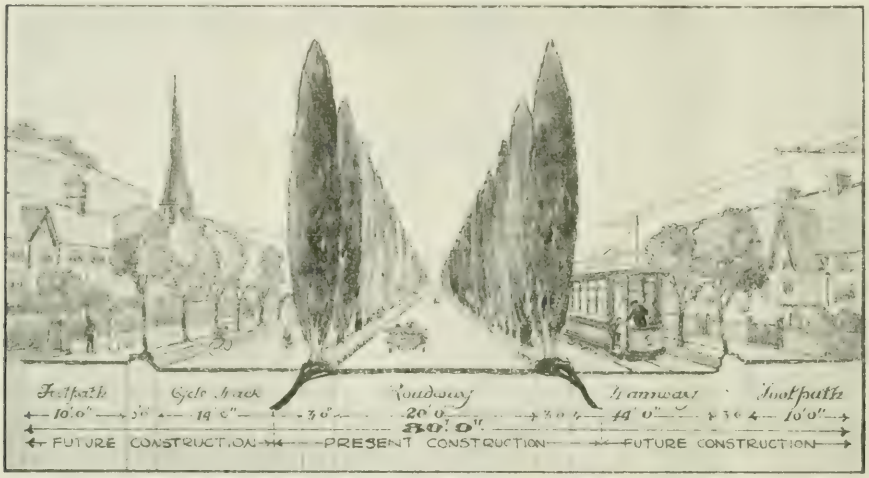
Manchester Architecture.—Mr. F. B. Dunkerley, in his presidential address recently to the members of the Manchester Architectural Society, expressed regret that the City Council and the Royal Exchange authorities did not come to an arrangement to carry out the larger and bolder scheme which was put forward for the extension of the Exchange. As regarded the site of the old infirmary—"still unoccupied save by a few jerry sheds and a great many weeds," "serving no better purpose than a rubbish heap"—he submitted that the council, if unwilling to provide for an art gallery and a library on the site, should build a library there and extend the present Art Gallery.

A NORTH WALES COAST ROAD.

FLINTSHIRE COUNTY SURVEYOR'S SCHEME.

In a report presented at the last meeting of the county council, Mr. Saml. Evans, F.S.I., the county surveyor of Flintshire, outlines his scheme for the laying out of a road giving direct means of communication between Gronant and Rhyl, by way of Prestatyn. At present, in order to travel from Gronant to Rhyl, it is necessary to pass over a highway which, winding as it does through the hills, is in places both tortuous and dangerous. The proposed new route takes an entirely different line, hugging the coast and being almost straight for the whole of its length. Good alignment and gradient, accommodating width and business-like directness have all been aimed at by the author of the scheme; at the same time the æsthetic side of the question has been kept in mind.

The county surveyor mentions 80 ft. as the width of land required for the road, but at present it is proposed only to run a 20-ft. carriageway through from end to end.



Gronant Rhyl Road. Proposed Cross Section.

"I want the road to be a creditable road when the first part—viz., the 20-ft. road—is completed," observes Mr. Evans in his report. "After that an endeavour would undoubtedly be made to plant trees alongside the highway, and what would grow quicker and have a more stately, dignified appearance than a straight 3-mile stretch of poplars, 50 ft. apart and 60 ft. high? On each side, as requirements make it necessary, a portion of the width would be set apart for a tramway or route for motor 'buses. Another width could be set apart for a cycle or riding track with green margins between each and spacious paved footways on each side for pedestrians."

Calcutta Roads.—The Secretary to the European Association has submitted a memorandum to the Bengal Government on the roads of Calcutta. In the course of it, he says: "My council believe they are correct in saying that the great majority of the 277 miles of roads in Municipal Calcutta have not been constructed on approved engineering methods of construction, but simply represent accretions of surfacing material, laid upon the very uncertain base provided by the deltaic silt characteristic of the locality. The road crust thus formed is inevitably of varying thickness, unequally supported, and consequently not such as can be expected to remain in proper condition when subjected to heavy loads moving at the legal limit of 12 miles an hour, or more. It appears to my council that in these circumstances it will probably be necessary to adopt a considerable programme of road reconstruction in the areas in which heavy motor traffic is permitted."

SOME WATERWORKS ENGINEERING MISTAKES.*

E. D. H. Mackay

In 1895 it became necessary for the Peoria Water Works Company, of which the writer was then engineer and superintendent, to increase its water supply and to do so rapidly. This plant included, among other items, an open well 11 ft. in diameter. In the construction of this well the earth was first excavated as far as the gravel water would permit, and a cast-iron well shoe, consisting of circular segments, was bolted together, and on top of this well shoe were bolted segments of cast-iron designed to widen the shoe and to serve as a "batter" for the brick masonry wall of the well. Excavation was started inside of the well, the masonry wall being built up on top of these segments as the well sunk. It was the intention to sink this well to bed rock, seal the bottom well concrete so as to make a watertight pit, and then drive air posts through apertures in the wall.

The writer, however, made the mistake of pumping from the inside of this well, part of the material being removed by the pumps and part by buckets, which were filled by men standing on the bottom. The well sank rapidly, from 2 ft. to 3 ft. a day, until within 12 ft. of bed rock, when its progress was suddenly diminished, and all efforts failed to get more than 4 ft. further. It was found that at about 8 ft. from bed rock the sand ran in under the shoe as fast as it could be removed.

An effort was then made to sink a steel ring, 10 ft. in diameter by 5 ft. in depth by ½ in. thick, on the inside of the well in the hope that this could be sent down to bed rock; but after much time had been lost in trying to keep ahead of the incoming sand, the attempt was abandoned. Oak wedges were then driven so as to close solidly the space between the ring and the wall of the well, and four 6-in. driven wells were sunk to bed rock. Four 6-in. push wells were also driven out through holes in the wall of the well, and all eight of these 6-in. wells were connected up to the centrifugal pumps, and the plant was finally put in operation. It has been operated successfully, whenever required, during the past nineteen years.

RUNNING SAND.

The reason why it was impossible to sink this well any further was that, as the well approached the bed rock, the area of the belt of water-bearing sand through which the water had to pass in order to reach the pump was constantly growing less. At the same time the rate of pumping was constantly increasing. Consequently, when the point was reached at which the velocity of the inrushing water became so great that it dragged in the sand, this sand simply continued to run in as fast as it was removed, and the well naturally could sink no further.

On looking back at the work, this explanation of the trouble seems so simple and natural that the writer has wondered many times why he did not foresee the difficulty; but he has since seen the same mistake made so often by others that he feels encouraged to hope that this description of his own experience may prevent someone else from going wrong in the same direction. In his own practice the lesson has been of much service, for it has led to the construction of a number of wells, in the design of which special attention was paid to the matter of preventing the inflow of sand, not only during the process of sinking the well, but also after the well has been finished and put in operation.

The particular well first described could have been sunk to bed rock at much less cost, either by the pneumatic process or by excavating from the inside with orange-peel bucket without pumping, or by sinking other wells outside of the large well and pumping from these to lower the water in the large well. As the sand was removed the well would have sunk, provided the weight of the well were sufficient to overcome the skin friction. No more sand would have run into the well because of the fact that the water would have had no velocity to cause the sand to flow.

This mistake of the writer was at the time an expensive one for his client, but he has the satisfaction of knowing that the extra cost of this well was saved many times thereafter in other wells sunk in better fashion for the same client.

TILE CAST IRON PIPES.

The writer made another mistake in connection with this same piece of work. The water furnished by the supplemental well was brought down by gravity to the main well some 3,300 ft. away. For conveying this water a 24-in. vitrified tile pipe was built. It was hoped that this tile pipe would cost much less than a cast-iron pipe, and it was believed that the tile pipe could be made practically watertight.

The attempt to make the pipe practically tight was successful, but the expense was so great that the writer can now see that he should have made this pipe of cast iron instead of tile, for much of the pipe had to be laid in quicksand, and where a great deal of ground water had to be taken care of, making it very difficult and expensive to make full cement joints in the tile, and to hold the pipe and the joint in place until the cement had set. Under these conditions cast-iron pipe would have actually cost less, laid in place, than the tile pipe.

Tile pipe has since been so often used for watertight work instead of cast iron, and so often with disappointing results, that it is hoped that a recital of the foregoing mistake may prove of service to others.

A third mistake entered into the design of a small waterworks, built about twenty years ago, and the writer's first complete waterworks installation.

This plant included an elevated tower and steel tank of about 60,000 gallons capacity, and for every part of that structure detailed working drawings were prepared. With the desire for originality—too often displayed by young men, inventors and others, lacking the wisdom of practical experience—considerable pains were taken to design connections which were novel. It is safe to say that the like of some of these connections has never been seen in any other structure, before or since.

The working out of all of these details not only multiplied the time required for the design of the structure by three or four, but the novelty of the connections also added several hundred dollars to the contract price, for the bidders could not use their standard shop connections, but were compelled to figure on the writer's more expensive and less practical designs.

The lesson to be learned from this last mistake is that no engineer, if he has his client's interests at heart, can afford to overlook the contractor's view point when he prepares his specifications.

Contractors must be expert in the practical details of construction, and especially in cheapening construction costs, or they cannot continue in business. If the young engineer wishes to learn more about these matters than he has ever learned before in the same length of time, let him, after he has prepared a rough draft of his plans and specifications, discuss these with a few of the more trustworthy and experienced contractors who are likely to bid on the work, and he will be astonished to find how many changes he can make to his client's advantage without in any way impairing the design of the work or the validity of the contract.

If the young man will then not let his exalted ideas of his dignity as an engineer prevent him from accepting suggestions of the contractors, he will show that he is worthy to receive much of the success which is almost sure to crown his future efforts.

From *Engineering and Contracting.*

Reduced Street Lighting in Surrey Towns.—The system of arc lighting has been discarded by the Kingston (Surrey) Town Council, and in most cases only one of the group of five incandescent lamps is being lit on each of the tall standards in the chief thoroughfares. If necessary the tops of the reflectors will be darkened. Steps have been taken by the Surbiton Urban District Council to darken the tops of some of the street lamps, so as to prevent them throwing any light upwards.

Pumps on Motor Fire Tenders.—A petrol motor tender belonging to the Bath Fire Brigade has just had its sphere of usefulness extended, a "Hatfield" pump having been fitted to the chassis by Messrs. Merryweather & Sons, who built the tender five years ago. The work has been carried out at Bath by one of the firm's mechanics, the new pump being geared to the existing propelling engine through silent chain transmission. The engine is a 50-horse power four cylinder, and the capacity of the pump is 350 to 400 gallons per minute. This is the first occasion on which Messrs. Merryweather have fitted a fire pump to an existing machine of their own make, but examples of "Hatfield" pumps fitted to other makers' chassis are in service at Huddersfield and Radcliffe.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

[illegible] Institution of Municipal and County Engineers [illegible] 92 Victoria [illegible] Mr. [illegible] the chair. J. P. Barber, J. A. Brodie, J. S. Brodie, W. N. Blair, G. F. Carter, J. W. Cockrill, R. H. Dorman, W. Harpur, F. Harris, T. W. A. Hayward, W. T. Lancashire, E. B. Martin, F. Massie, L. S. McKenzie, P. H. Palmer, W. H. Prescott, N. Scorgie, H. E. Stilgoe, R. J. Thomas, H. T. Wakelam, C. F. Wike, O. E. Winter, the hon. secretary (Mr. T. Cole) and the secretary (Mr. J. W. Dudley Robinson). Apologies for absence were received from Messrs. H. P. Boulnois, C. Brownridge, A. D. Greenhow, E. P. Hedley and E. G. Mawbey.

THE MEMBERSHIP ROLL.

The following applications were approved for election to membership:—

Members: Messrs. E. H. Collcut, engineering inspector to the Road Board; A. W. E. Fawkes, waterworks engineer, Calgary, Alberta, Canada; A. Hobson, engineer and surveyor to the rural district council, Grimsby; L. W. F. Howitz, chief draughtsman, Irrigation Department, Pretoria; A. W. Lloyd, county surveyor (Southern Division), Holland, Lincs, County Council; L. W. Pye, chief assistant surveyor to the urban district council, Cleethorpes; and H. L. Richardson, surveyor to the rural district council, Martley.

Associate-members: Messrs. S. F. T. Chandler, assistant engineer, Transkeian Territories General Council; T. J. Evans, county surveyor's department, Trowbridge; D. R. Nicholls, engineering assistant to borough engineer, Halifax; H. D. Sowerby, chief assistant, county road surveyor, Fife; and A. E. Wheatley, city engineer's department, Nottingham.

Students: Messrs. N. A. Alker, articled pupil to surveyor, Chorley Urban District Council; T. W. Bennett, articled pupil to surveyor, Easthampstead Rural District Council; G. W. Mann, borough surveyor's department, Ossett; R. A. Newstead, articled pupil to borough surveyor, King's Lynn; J. T. Robinson, 33 Coleshill-street, Atherstone; D. S. Samuel, assistant surveyor to Carmarthenshire County Council; A. J. Westaway, articled pupil to borough surveyor, Totnes; and A. F. Wyeth, articled pupil to surveyor, Epsom Urban District Council.

Transfers from Associate-member to Member: Messrs. A. W. D. Brown, engineer to the Shire Council of Swan Hill, Australia; H. Sanderson, chief assistant to borough engineer, Accrington; and W. B. Smith, engineering assistant to borough surveyor, Paddington, W.

Transfer from Student to Associate-member: Mr. G. Ponsford, deputy surveyor to the urban district council, Exmouth.

ACTING EXAMINERS.

The following acting examiners were reported to have been appointed for the examinations held on September 29th, 30th, and October 1st, 2nd and 3rd: Superintending examiner, J. S. Brodie; town planning, E. J. Elford; engineering, 1st paper, J. S. Brodie; engineering, 2nd paper, E. J. Silcock; building construction, E. Willis; sanitary science, H. Shaw; municipal law, S. G. Turner.

BRITISH STANDARD SPECIFICATION FOR BROKEN STONE AND CHIPPINGS.

A letter from the Engineering Standards Committee, dated August 20, 1914, was read, and it was decided to suggest certain amendments with regard to the maximum length of stone and dust to the specification.

NATIONAL INSURANCE ACT, 1911 (UNEMPLOYMENT).

Mr. R. J. Thomas reported that, as one of the four representatives appointed to attend the conference with the umpire on the unemployment insurance of roadmen, he had now received a draft copy of the award, of which he gave a *résumé*.

It was decided to recommend that the umpire be informed that the council did not approve the draft award.

THE N.A.L.G.O.

It was resolved to recommend that Mr. N. Scorgie be appointed as representative of the institution on the General Purposes Committee of the N.A.L.G.O.

SUPERANNUATION.

A letter was received from the secretary to the N.A.L.G.O. as follows:—

"I am directed to inform you that the President of the Local Government Board has now communicated with the Association of Municipal Corporations, the County Councils' Association, the Urban District Councils' Association, and the Rural District Councils' Association, in accordance with his promise to the deputation from this association which awaited upon him last month. Mr. Samuel has to warded to each of the before-mentioned associations a copy of his reply to our representatives—a full text of which appears in the present month's issue of the *Municipal Officer*—and has invited their 'observations on the subject, and if they should be in favour of the proposal generally, any suggestions which they might desire to make would receive the president's careful consideration.' You will no doubt be fully aware that the representatives on the councils of the associations mentioned (which represent the whole of the authorities covered by our branches) consist of members of councils, in addition to town clerks, clerks to the councils, &c., and it is assumed, more particularly in connection with the Association of Municipal Corporations, that, when the communication from the President of the Local Government Board is under consideration, the voting thereon may be left to 'others than officials,' and I am therefore directed to ask your committee to take this matter into their immediate consideration with a view to enlisting the sympathies of your council's representatives—who are not officials—to ensure a favourable decision being given in favour of the proposed inquiry, when Mr. Samuel's letter is under consideration. The importance of taking this step without delay will be obvious to you, and I am to suggest that you should confer with your chief officer, or officers, as to the best way to achieve the object of this letter. If your association or guild covers a number of authorities, I am to request that you will endeavour to secure the sympathies of the representatives of each authority so covered."

It was decided to draw the attention of members to the matter, so that they might take individual action.

INSTITUTION MEETINGS.

It was resolved that May 8, 1915, be approved as a provisional date for the postponed meeting at Scarborough.

LETTERS OF CONGRATULATION.

It was resolved that letters of congratulation be sent to Mr. Thomas Adams, on his appointment as town planning adviser to the Canadian Commission of Conservation, and to Prof. Adshead, on his appointment as Professor of Town Planning at the University of London.

NATIONAL ROAD CONGRESS, 1915.

In view of the impossibility of many members attending the proposed congress, owing to the depletion of their staffs and other causes connected with the war, it was resolved "that, in the opinion of the council, the present state of public affairs renders it inexpedient to hold the proposed conference in 1915, that it should therefore be postponed to a more convenient date, and that in the circumstances they cannot undertake to co-operate with the County Councils' Association as suggested."

TESTAMUR EXAMINATION, OCTOBER, 1914.

The acting examiners' report was received, and it was resolved to award the testamur to Messrs. E. T. Annett, G. S. E. Barker, W. A. Burn, R. E. David, F. St. G. J. Fox, J. H. Gregson, R. Hudson, Gylbert Kershaw, G. W. Lawson, and G. Ponsford.

TOWN PLANNING CERTIFICATE EXAMINATION, SEPTEMBER, 1914.

The acting examiners' report was received, and it was resolved to award the Town Planning Certificate to Messrs. E. M. Bate, A. J. Price and W. H. Price.

NORTH-WESTERN DISTRICT: EXECUTIVE COMMITTEE.

The election of the Executive Committee has resulted as follows:—

Members: Messrs. J. A. Brodie, city engineer, Liverpool; E. L. Morgan, borough engineer, Bolton; S. S. Platt, borough engineer, Rochdale; A. J. Price, borough engineer, Lytham; J. A. Settle, borough engineer, Bury; E. Worrall, surveyor to urban district council, Stretford.

Associate-members: Messrs. W. Debney, borough engineer's office, Birkenhead; A. J. Price, borough engineer's office, Eccles.

BASINGSTOKE ELECTRICITY WORKS.

The idea of the introduction of electricity into the town of Basingstoke was first mooted in 1894, when a report and estimate of cost was presented by a well-known electrical expert. Financial reasons, however, doomed this to failure. In 1902 the idea was again proposed forward and further reports and plans were submitted by another electrical engineer. A scheme was approved and a Provisional Order obtained. Negotiations were carried forward for a considerable time with a company who were prepared to lease the Order from the corporation on what appeared to be favourable terms. The Board of Trade, however, refused to sanction the suggested proposals, and the scheme thereupon fell through. The corporation were then unwilling to work the undertaking themselves, and in the end the Provisional Order was revoked by the Board of Trade.

Basingstoke Electricity Works.
(View shows office block in front and engine and battery room in rear.)

In June, 1912, the subject again came up, consequent on a letter from the London and South-Western Railway Company asking if the corporation were likely to be in a position to give them a supply. The borough engineer, Mr. F. Reginald Phipps, Assoc. M.Inst.C.E., F.S.I., was thereupon instructed to bring up a report on the subject, and especially to advise as to whether the corporation should themselves undertake a supply, or allow a company (who had intimated their willingness) to do so.

A small deputation, with the borough engineer, visited various towns, and after carefully considering their report and the proposals of the company, the council decided to establish an undertaking themselves. The borough engineer was thereupon appointed to carry out the scheme, and to prepare the necessary plans and estimates. A Provisional Order was applied for in the autumn of 1912 and duly obtained, though the local gas company opposed, and intimated their willingness to supply electricity themselves. On receipt of the Royal Assent to the Order, application was at once made to the Local Government Board for a loan of £14,000 for the carrying out of the scheme. An inquiry was held on December 18, 1913, by Mr. T. C. Ekin, and sanction to the loan was granted on February 11, 1914. The work was immediately put in hand, and the opening ceremony took place on Thursday of last week, the 15th inst.

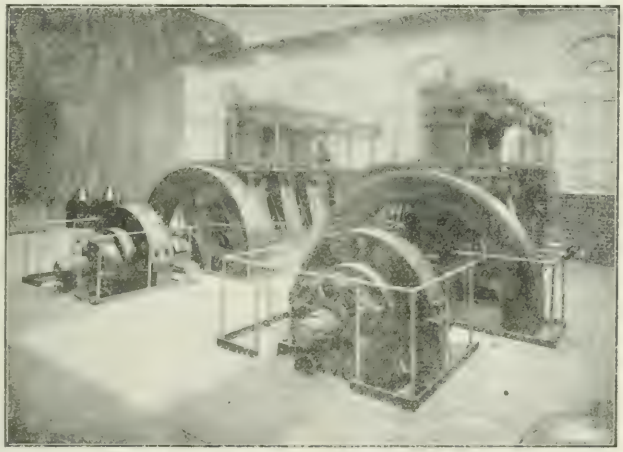
The loan as sanctioned was as follows: Land and expenses, £340 (sixty years); buildings, £1,950 (thirty years); machinery, cables and crane, £8,550 (fifteen years); pressed steel poles and services, £1,100 (fifteen years); switchboard, £510 (seventeen years); public lighting, £460 (ten years); battery, £890 (seven years); meters, £200 (five years); total, £14,000. The repayment of principal and interest will amount to about £1,280 per annum. It is hoped to publish a detailed description of the scheme at a later date, but the general features are as follows:—

The generating station is of pressed bricks with Portland stone dressings, and contains engine-house, with temporary end to hold three sets of Diesel engines of 150-b.h.p., battery-room of two floors, offices, workshop, store-room, meter test-room and cooler-house. The machinery comprises two Diesel sets of 150-b.h.p. each, direct-coupled to the 100-k.w. generators, booster, balancer, and motor-driven cooler and softener. There is a separate network of cables for public and private lighting. Other items are a battery of 270 cells (135 on each floor), having a capacity of 300 amp.-hours at the four-hour rate, with glass boxes large enough to add plates to 500 amp.-hours; also switchboard, with spare panels for extension, and a 6-ton overhead traveller.

The undertaking starts with good prospects of success, the probable demand of the London and South-Western Railway Company being 80,000 units per annum, while a good day load is anticipated from the various factories in the town. The system of supply is continuous current at 460-230 volts.

Mr. G. Broadhurst, A.M.I.E.E., who has acted as clerk of works on the undertaking, has been appointed as resident electrical engineer, and takes over the future charge of the works.

At the commencement of last week's proceedings, the Mayor of Basingstoke, Mr. Councillor Cannon, J.P., gave a brief account of the various stages of the movement of which that ceremony was the complement, and remarked that the station was expected to be a success financially; beyond that it was hoped that the electric lighting and power would lead to the establishment of new industries in the town. His Worship then called upon the borough engineer, Mr. F. Reginald Phipps, Assoc.M.Inst.C.E., F.S.I., who, in a few well-chosen words of compliment, presented to the chairman of the Lighting Committee, Mr. Councillor Tigwell, a handsome silver-gilt key, bearing a commemorative inscription and the borough coat of arms. After thanking the mayor and Mr. Phipps for the honour, Mr. Tigwell unlocked the door of the new building. Subsequently Mr. Tigwell continued his



Engine-room, Basingstoke Electricity Works.
(Showing two Diesel Sets of 150-b.h.p. each.)

[illegible] they had carried out the work, and the borough engineer for his devoted service in the whole matter.

[illegible] confidence they had placed in him in allowing him to [illegible] He [illegible] rendered him such great assistance in the work. First of all he wished to thank his old friend Mr. Morgan, [illegible] Mr. Drummond, he should also like to express his great thanks for the assistance he had rendered in the building part of the work. He acknowledged also the services of the quantities surveyors, Messrs. Smith and Bryant, and desired to add his thanks to the contractors, who, in his opinion, had done their work in a most satisfactory manner. He was sure that the building was put together in a solid and substantial [illegible] would last many years. The whole of the machinery and plant was, in his opinion, everything that could be wished, and if they were to start [illegible] in regard to which they could make improvements.

The machinery was afterwards started by the Mayor.

The photos which we are able to reproduce are by Terry Hunt, Basingstoke.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.
—MASSINGER: "The Fatal Dowry," Act ii, 2

GLOSSARY OF ROAD TERMS.

To the Editor of THE SURVEYOR.

SIR,—I trust I may be excused for not having replied earlier to Mr. H. Percy Boulnois' letter dealing with [illegible] of his "Glossary of Road Terms." I am much gratified to learn that Mr. Boulnois considers my review to be "exactly the description of criticism necessary to make the book useful," though I would prefer to say "even more useful than it is at present." Mr. Boulnois' most valuable qualification in this matter is his judicial attitude of mind, which enables him to recognise the value of sound criticism, however keen, and to perceive the weak points in proposed alterations.

Dealing now with the various points in his letter: I give first my suggestions for defining the four words in his third paragraph.

PUN.—To ram or beat earth, concrete, &c., into place, ramming it locally, rather than as a mass or from above.

PUNNER.—A rammer, usually of relatively small diameter.

PUG MILL.—A machine in which horizontal arms rotate in a cylinder or barrel; used for mixing clay, mortar, &c.

SCARIFY.—To loosen or to break up the surface of a carriageway—(1) with picks; (2) by the ploughing action of tines attached to a steam roller or other travelling machine.

DRAG.—See "Skid-pan" and "Road-drag."

SKID-PAN.—A small iron sledge or shoe on which the wheel of a cart or wagon rides when descending hills.

ROAD-DRAG.—A machine consisting of two half-round or sawn timbers, connected by cross-pieces [the front timber being usually provided with an iron cutting edge], pulled along an earth or gravel road by horses, squarely for smoothing, and on the skew for shifting material to or from the centre.

As regards the word "crust," I maintain that it is inadvisable to regard it as distinct from a bottoming or foundation. The separate foundation principle is usually a wrong one, the so-called concrete foundation provided for carpets of wood or asphalt being in fact the crust.

It might be defined thus:

CRUST.—The [illegible] thickness of the layers of material put down to form the carriageway of a road; but not including [illegible] in small road beds, [illegible] surfaces.

As regards the next three words: The definition of "invert" is good as far as it goes; but as the word appears to be [illegible] and [illegible] diameter, the definition needs extending. As regards "lagging," my point is that the first part of the definition should not seem to restrict the use of the word to tunnel work. Certainly it applies to bridge work, not only for arches, but also for other kinds of [illegible] and [illegible] Has it not even a wider meaning?

The term "[illegible]" is an important matter of principle. A definition should not be made by using words which are less well-known than the term defined. I would proceed thus:

STRUT.—A compression member or a stay; [illegible] A post or normal timber exerting an end thrust.

To strut.—To prop, to support with timber.

STAY.—A rope, wire, or chain, steadying a post or other structure by exerting a pull.

BOOM.—(On land), an inclined beam or mast, or pair of such.

DERRICK.—A boom, supported by posts and stays.

With regard to geological terms and "trade names," I note that Mr. Boulnois does not defend his glossary, nor the Standard Committee. *Their* position is, indeed, indefensible—unless "might is right." Topographical terms, Mr. Boulnois agrees, might be dealt with more fully. I think that he will find many that should be added, and I hope that in a later edition of his work he will be disposed to give the space needed to allow of law and administrative terms being included.

Mr. Boulnois has me fairly with regard to the word "swim." It would only be used in answer to the question "When is a ford not a ford?" (By the way, "ford" is not in the glossary.) What I meant to point out with respect to "immerse," "decay," "charge," and similar words, was this: If words such as "spread" and "decay" are not regarded as too well-known for inclusion in a glossary of *road terms*, why not include such words as "carry" and "load"?

Either the glossary should be made larger by adding a number of generally useful words, or, logically, space may be found for longer definitions of road terms by throwing out words the meanings of which ought to be generally understood.

The telegraph boy, O.H.M.S., interrupts what I was going to write in acknowledgment of Mr. Boulnois' exceedingly courteous treatment of a fault-finding reviewer, and as the matter is urgent I must close this letter at once.—Yours, &c.,

YOUR REVIEWER

October 6, 1914.

THE LIMMER ASPHALTE PAVING COMPANY.

To the Editor of THE SURVEYOR.

SIR,—It has been brought to our notice that there exists in the minds of some of your readers some misconception as to the constitution of this company and the composition of our board of directors.

We hope, therefore, you will allow us to make the following authorised statement:

(1) The company, which was established in 1871, is entirely British owned, and none of its shares are held by either Germans or Austrians.

(2) Our freehold mines, some hundreds of acres in extent, purchased twenty years ago, are situated in the Bassin de Seyssel, Haute Savoie, France.

(3) We own no property whatever in either Germany or Austria.

(4) Our principal supplies of asphalte for damp-course, roofing and flooring, &c., are drawn from our own mines in France, and for compressed asphalte carriageway work from the well-known mines at Ragusa, Sicily.

(5) Our supplies of bitumen for our general business, and for the manufacture of our well-known "Bitma" roofing felt and roofing compounds, and our "Bitmarin" bituminous specialities, are drawn principally from British colonies, and we never, under any circumstances, purchase the artificial so-called "bitu-

The Surveyor

and Municipal and County Engineer.

CHIEF CONTENTS

[illegible]
Institution of Municipal and County Engineers—Council Meeting
[illegible]
Municipal Engineers' Notices
[illegible]
Municipal Contracts Open
Municipal Contracts Open
Municipal Work in Progress and Projected
[illegible]
Pro Patria
[illegible]
Surveyors' Institution: Notices
Tenders for Municipal Work and Supplies
The Duty to Demolish
The Lowest Tender
Things One Would Like to Know
[illegible]
Water and Sewage Engineers' Meetings
Waterworks Road

[illegible] imported into this country from Continental sources.

(6) We employ at our London works and branches in London and in Paris several hundreds of workmen, and we have effected to hold our staffs and our workmen in both countries every facility for joining the colours, and have arranged that none of the dependents of our people shall be left in want.

(7) Our business is entirely British managed, and we have had a single German or Austrian in our employment in any part of the world.

(8) Our directors are: Henry Holloway, Esq., J.P., chairman; H. D. Blake, Esq., managing director; Sir Courtauld Thomson; G. R. W. Wheeler, Esq.

We trust that the above information will make our position clear to your readers.—Yours, &c.,

THE LIMMER ASPHALTE PAVING CO., LTD.
G. Mitchell, Secretary.

Caxton House,
Westminster, S.W.
October 20, 1914.

MUNICIPAL HOUSING AND THE EMPLOYMENT OF LABOUR.

To the Editor of THE SURVEYOR.

SIR,—With reference to your leader in THE SURVEYOR of October 9th, I have recently built eight [illegible] (ground floor and four on first floor) by direct labour for my council.

The cost of the buildings was £1,330.

Labour represented approximately 40 per cent and materials 60 per cent of the cost.—Yours, &c.,

JOHN L. REDFERN,
Borough Surveyor.

Gillingham.
October 15, 1914.

[In the note referred to by our correspondent reference was made to the opinion, which is widely held, that the carrying out of housing schemes would [illegible] building work, and thereby [illegible] distress would be relieved. The question as to the relative amounts spent on labour and materials was raised, and it was suggested that information regarding a semi-detached cottage, built in a medium-sized or small provincial town at a cost of about £200, reckoned on a basis of 4½d. per foot cube, apart from levelling and fencing, but including drainage, would be specially useful.—Ed. SURVEYOR.]

Rosyth's Proposed Boulevard.—Among the features of the Rosyth town planning scheme are included three great roads to radiate from a common centre in proximity to the dockyard. One of these will be a boulevard 100 ft. wide and 1,000 yds. long.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Does [illegible] Royal Sanitary Institute in training the 750 men for the Ambulance Corps, and the staff of men have been in the employ and at the Institute? Is it not remarkable that there have been 10,000 attendances at the various lectures and demonstrations, and that all this work has been carried on voluntarily by the staff and the professional men who volunteered their services? Is not this an example of patriotic effort which might well be followed by other institutions?

* * * *

Why is it that recruiting is so backward in many of our rural districts—especially in the West of England? Is it because the people in country villages do not realise the gravity of the crisis through which we are now passing, and that unless they bestir themselves their hearths and homes, and even their lives, are jeopardised by their inaction? What can be done to put a little more patriotic life into these people?

* * * *

How is recruiting going on for the 2nd London Sanitary Company, about which Captain Arthur J. Martin wrote to THE SURVEYOR about a fortnight ago? Does it not seem to be the exact line that should be taken up by a young man who is anxious to do something for his country, and at the same time to keep in touch with his profession? Are there not a large number of engineering and architectural assistants who are now out of work owing to the war and who would find it worth while to write to Captain Martin at the Duke of York Schools, Chelsea, and make some inquiries as to this corps with a view to joining?

* * * *

Is not the little town of Hinckley, in Leicestershire, an example of what can be done in a district of only 13,250 inhabitants when under able and energetic management? Was it not refreshing to hear from Mr. Crump, the surveyor, at the district meeting a few weeks ago, that this small town already possessed its own gas and water works, that it also had public baths, a free library, an excellent system of sewerage and sewage disposal works, and that it has embarked on an excellent housing scheme? Could we not say to other towns of this or even greater size: "Go thou and do likewise"?

* * * *

Why is it that so many of the less important roads and lanes in this country, especially in Devonshire, are so much below the level of the adjoining land? Is it, as has been stated, because in former days each farmer in turn had to plough up the surface of the roads, thus making them lower and lower? If this is a fact, what became of the soil that was removed? Is there anyone who can give a really satisfactory solution of this problem?

* * * *

Is it not rather astounding to read in the daily papers of a certain large manufactory suspected of being merely a platform on which heavy siege guns could be placed for use against London? While not convinced as to the accuracy of the theory advanced in this particular case, may there not be constructions of the kind alleged in other parts of the country, and should not the local surveyors and building inspectors be able to give some valuable information to the police or other authorities where they suspect that such buildings have been erected or are in course of erection?

* * * *

Is there not a good deal worthy of consideration in Mr. Hartfree's suggestion for the formation, if possible, of a "Municipal Engineers' Technical Reserve" during the war? Is it not possible that there may be a considerable number of surveyors or engineers in municipal employment throughout the country who have some special technical knowledge that would be of great value to the War Office, if these men could be discovered and enrolled in a corps?

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. N. S. Jeffrey, of Darlington, has selected in respect of the September premium:

Chamock's "Graphic Statics" vols. 1 and 2 (Halden);

Mitchell's "Advanced Building Construction" (Batsford);

Larard & Golding's "Practical Calculations for Beginners" (Griffin);

and these books have been duly sent to him.

QUESTIONS.

This week answers are invited to the following questions:

430. Materials.—In what respects do Portland and Roman cements differ, and in what circumstances is the latter used? ("Beginner.")

431. Water Supply.—Explain the difference between surface springs and deep springs, and state the geological conditions in which each occur.

432. Ventilation.—What is the distinction between "natural" and "artificial" ventilation?

433. Mechanics.—Show how to find the periodic time of one complete vibration in a case of simple harmonic motion, and give a proof of the necessary formula.

434. A Question in Statics.—A light rod, of length 3 ft., whose weight is neglected, has equal weights attached to it, one at 9 in. from one end and the other at 15 in. from the other end. If it be supported by two vertical strings attached to its ends, and if the strings cannot support a tension greater than the weight of 1 cwt., what is the greatest magnitude of the equal weights? (H. P. M., *Towyn.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

425. Strength of Materials.—Explain why the resistance of a long strut depends more on the stiffness of the material than on its strength.

A short strut, say of 3 or 4 diameters in length, would fail under compression, due to the direct compressive stress. In the case of a long strut the failure is largely due to the bending stress as well as the direct compressive stress. Anything which stiffens the strut against bending obviously will strengthen it; and for this reason columns are made of hollow circular section, or built up with L irons or T irons, so as to have great resistance to bending. Fixing the ends of a strut also increases the resistance to bending.

Struts are usually proportioned by the Rankine formula, which is based on experiment:—

$$\frac{W}{A} = \frac{f}{1 + a\frac{l^2}{k^2}}$$

wherein—

W = buckling load in tons.
A = Area of cross-section.
f = Working stress in tons per square inch.
l = Length of strut in inches.
k = Least radius of gyration, also in inches.
a = A constant.

The fraction $\frac{W}{A}$ clearly represents the resistance of the strut. Now, for a given case, we know that a, l, and k are all constant, and we may therefore write the formula:—

Resistance is proportional to working stress.

In other words, the resistance is directly proportional to the strength of the material.

Now we have used the expression "radius of gyration." This factor is directly connected with the moment of inertia of a section by the formula—

$$I = \frac{W}{g} k^2$$

wherein—

I = Moment of inertia of strut about its axis.
W = Weight of strut.

And for a given case W and g are constant, and hence $I \propto k^2$, i.e., moment of inertia $\propto$ (radius of gyration)^2.

Now, from the Rankine formula we also notice that for a given case the resistance is proportional to the square of its radius of gyration, which, in its turn, is proportional to the moment of inertia—*i.e.*, the stiffness, of the strut.

Hence, if we increase the radius of gyation, the stiffness of the material is proportionately increased as the *square* of the radius—*i.e.*, the resistance of the strut is more dependent on its stiffness than on its strength. (T. W. P., *Bexhill-on-Sea.*)

429. Mechanics.—A pair of blocks have three sheaves in the upper and two in the lower block. Find the pull required to raise ¼ ton, assuming ⅖ of the energy wasted.

For a pulley of this type we have—

$$nP = W + w$$

where P = effort required
W = load
w = weight of lower block
n = number of pulleys.

In this case, therefore, neglecting w (which is taken into account in the correction for energy wasted)

$$5P = \frac{2240}{4} \text{ lb.}$$

$$\because P = \frac{2240}{5 \times 4} \text{ lb.} = \text{theoretical effort.}$$

But $\frac{2}{5}$ of the total energy is wasted.

$\therefore$ the above theoretical quantity $P = \frac{3}{5}$ actual effort.

$$\because \text{actual effort} = \frac{5 \times 2240}{5 \times 4 \times 3} = 186\tfrac{2}{3} \text{ lb.}$$

(B. K., *Hayes.*)

Note.—P. T. (*Middleton*) has been credited with the answer from which his initials were inadvertently omitted last week.

Royal Institute of British Architects.—The first ordinary general meeting of the session will be held on Monday, November 2nd, when the chair will be taken by the president, Mr. Ernest Newton, A.R.A., at 8 p.m. The president will briefly address the meeting, and make an announcement respecting the prizes and studentships, 1915.

Chadwick Public Lectures: War Programme.—The Chadwick Trust have arranged a series of lectures on military hygiene. On November 14th, 21st and 28th, at 3 p.m., at Bedford College, Regent's Park, N.W., Dr. A. T. Nankivell will deal with "Camp, Ship and Hospital Hygiene"; on December 4th and 11th, at 8.15 p.m., Sir Ronald Ross will lecture at the London School of Economics, Clare-market, Kingsway, W.C., on "Government and Military Sanitation in the Tropics"; and on January 15th, 22nd and 29th, at 5.15 p.m., Dr. F. M. Sandwith will deliver lectures at the Royal Society of Arts, Adelphi, W.C., on "War and Disease." Further particulars of these and other lectures can be obtained from the Secretary to the Trust, 8 Dartmouth-street, Westminster.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, at correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction, i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

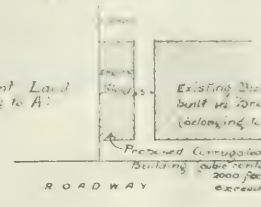
Highway Bridges over Railways and Canals.—"J. W." writes: I understand that by a recent decision a local authority can call upon a railway or canal company who are the owners of and responsible for the maintenance and repair of any bridge by means of which roads or streets are carried across a railway or canal to reconstruct the bridge if it is not strong enough to carry the increased traffic which has grown up since the bridge was constructed. I should be glad if you would inform me if there are any decisions whereby a local authority can call upon a railway or canal company to widen a bridge which, although strong enough to carry the increased traffic, is not wide enough to take such traffic without serious inconvenience. In this district there is such a bridge 12 ft. wide, and since its construction some fifty or more years ago the narrow roads or footpaths leading to it have been laid out by the abutting owners as streets 36 ft. wide. These streets are now fully built on, and the bridge, although strong enough, is a serious obstruction to the traffic on the street. Can the local authority call upon the railway company to widen this bridge?

There are two recent decisions as to the standard of repair of bridges—one relating to a bridge over a canal, and the other to a bridge over a railway. See *Thorne-Thomsett v. Sharpness, &c., Company* (page 520 of vol. xlv. of The Surveyor), and *Sims v. Great Northern Railway Company* (page 1020 of the same vol.). With regard to bridges carrying highways over railways, by sec. 51 of the Railways Clauses Consolidation Act, 1845, if the width of the road is increased the company must widen the bridge at their own expense to such extent as the highway authority may require, not exceeding the maximum width prescribed by sec. 50—viz., 35 ft. for a turnpike road, 25 ft. for a public carriage road, and 12 ft. for a private road (unless otherwise provided by the special Act). This Act, however, does not apply to bridges over canals, and in the absence of any provision in the special Act under which the canal was made it would appear that the canal company cannot be compelled to widen such bridges.

Water Supply: Cemetery.—"Church" writes: There is a cemetery without a water supply for drinking purposes, which is used by the inhabitants of every creed in the parish, but which is held in charge by the church. A farm adjoins (this belongs to the church: the vicar receives the rent as part of his stipend), and in the yard there is a pump well, which is the only supply the inhabitants can use for drinking purposes when visiting the cemetery. An analysis of this water has been taken, and it is condemned as unfit for use. The council's water main is about 800 yds. away from the farm and cemetery, and the cost of taking a one-inch pipe for both places would be £60. The vicar of the parish contends that it would be unfair for him to spend this amount for his farm, as the people would go into his yard, as they do at present, for water. My water committee agree with him on this point. Have the Rural District Council power to spend, say, two-thirds of the cost of taking the water to the cemetery (not to the farm), and to ask the vicar to spend the other third to supply his farm?

In my opinion the council have power, under sec. 51 of the Public Health Act, 1875, to bring their main to within a reasonable distance of the cemetery and farm (assuming these are not within the limits of supply of any water company). Having done so, they can then compel the owner of the farm to take a supply under sec. 62 of the Act; or, alternatively, under sec. 3 of the Public Health (Water) Act, 1878, they can compel him to take a supply if the cost of executing the necessary works will not exceed £8 13s. 4d., or such other sum, not exceeding £18, as the Local Government Board determine to be reasonable. If there is an occupied dwelling-house at the cemetery, the owner thereof could be compelled to take a supply in the same way.

Building By-laws.—"Corrugated" writes: Plans have been deposited for the erection of a corrugated-iron building in the position shown on sketch, the proposed building to be used as an engine shed. I would like your opinion as to whether a council would be justified in refusing to pass the plan as not being in accordance with the following by-law relating to "iron buildings": "(1) Any building comprising not more than one story—(*a*) The external walls of which shall be constructed of, or wholly covered with, galvanised, corrugated, or other sheet iron; (*b*) which shall not exceed in height 12 ft. as measured from the level of



the ground adjoining the walls to half the vertical height of the roof, and shall not exceed in extent 2,000 cub. ft.; (*c*) which shall not be constructed or adapted to be used either wholly or partly for human habitation; (*d*) and shall be distant at least 10 ft. from the boundary of any adjoining lands or premises."

In my opinion the proposed building does not conform to clause (*d*) of the by-law, and the council would be justified in disapproving the plan.

Highway: Retaining and Fence Walls.—"W. R. D." writes: In this district there are several places where the highway is on a higher level than the adjoining land, and is supported by a retaining wall, and I shall be obliged if you will advise me: (*a*) Is the highway authority or the landowner responsible for keeping the retaining wall in repair? (*b*) Where a fence wall is erected on top of the retaining wall, is the highway authority or the landowner responsible for its repair? This refers to a fence wall which cannot possibly be of any use for confining the stock in the fields, the road being anything from 6 ft. to 12 ft. higher than the land, and I might say that I am unable to trace by whom the walls were originally erected.

(*a*) The easement of support derived from a retaining wall implies, in the absence of proof to the contrary, a duty on the part of the highway authority to repair the wall. The landowner would not be liable in the absence of proof of a prescriptive obligation on his part. (Copnall's "Law Relating to Highways," 2nd edition, pp. 264, 265.) (*b*) As a general rule there is no obligation on the part of the highway authority to repair a fence wall adjoining a highway. But where a fence or wall protecting a highway against a precipice forms part of the highway the authority are liable if such fence or wall is suffered to become dangerous by reason of non-repair. Whether or not the wall is part of the highway is a question of fact for a jury to determine (*ibid.*, p. 264). Unless sec. 30 of the Public Health, &c., Act, 1907, is in force in the district, the landowner cannot be compelled to repair the wall, but if it is his wall, and not part of the highway, and gets into such a dangerous state as to be a public nuisance, he would be liable to pay damages to anyone suffering injury in consequence. (See *Harrold* v. *Watney*, 1898, 2 Q.B., 320.) If sec. 30 of the Act is in force in the district, and the wall is for want of sufficient repair dangerous to passengers, the landowner can be compelled to repair it, or to repay to the authority the cost of its repair, assuming that the wall is his property and not part of the highway.

By-laws: External Walls.—"By-law" writes: I shall esteem it a favour if you will let me have your answer to the following: A plan of two houses, B and C, was submitted to me for approval. There is an entry between the two houses, and the chamber floors are carried over it. Along the entry is shown 4½-in. brick walls to the front room of house B, and the back room of house C. Enclosed are by-laws in force within the district. (1) Do you not consider the 4½-in. walls to be walls which enclose the said parts of the two houses, and is it not immaterial whether walls are exposed to the atmosphere or adjoin some other building which forms no part of the premises; that these

walls are external walls. (2) Do you not consider the [illegible] walls in the city to be external walls within the meaning of the bye-laws.

External wall is defined in bye-law [illegible] as meaning an outer wall of a building not being a party wall even though adjoining the wall of another building. In my opinion the [illegible] walls are external walls within this definition and within the meaning of the bye-laws.

[illegible] Planning Scheme—New Main Road.

[illegible] property through which the road would run objects [illegible] property. If they can make such work [illegible] pay compensation [illegible] the owner?

Under sec. [illegible] subsec. (1) [illegible] of the Housing and Town Planning Act 1909, the authority may, after giving such notice as provided by the scheme, and in accordance with the provisions of the scheme, execute any work which it is the duty of any person to execute under the scheme in any case where it appears that delay in the execution of the work would prejudice the efficient operation of the scheme. If the scheme imposes the duty of constructing the main road on any person or persons this provision will apply. Any person whose property is injuriously affected will be entitled to compensation under sec. 58, subject to the limitations specified in sec. 59.

SOME RECENT PUBLICATIONS.*

Applied Mechanics. Vol. I. Statics and Kinetics. By Charles E. Fuller, S.B., and William A. Hosmer, S.B., Professors of Theoretical and Applied Mechanics, Massachusetts Institute of Technology. Price 10s. 6d. nett. London: Chapman & Hall, Limited.

This work is intended "primarily for students who have had a preliminary training in the fundamentals of mechanics, in a course in physics, and also in a course in the elements of mechanism." Underlying theory is discussed "in so far as it will help to elucidate the principles which are required in the solution of problems in engineering. . . ." The methods of the calculus have been employed "when these appear to furnish the most direct method of analysis. In general, however, only the simpler operations in differentiation and integration are required." A large number of problems are included, but the answers are, unfortunately, not given except "when it was deemed necessary to indicate the methods of applying the principles." The practical value of the book would have been considerably increased by the addition of a list of answers to those problems which are not worked out in the text. The authors seem, however, to have carried out successfully their main purpose. The various theorems of the subjects included are stated clearly, the methods of analysis are direct and are very clearly set forth, and the practical applications are of a really useful character. Equations and physical constants relating to various dispositions of area and mass are so printed as to be readily found, in close connection with the demonstrations of the methods by which they are determined. The printing throughout is excellent, and the diagrams, of which there are 241, are very well drawn. The book may, therefore, be recommended to engineers.

Some of us will not be able, however, to commend the author's treatment of basic principles. They recognise five fundamental conceptions of mechanics—matter, space, time, motion, and force. Many of us consider that three of these are enough. Given space, time, and visible matter, the idea of motion may be derived. Given time and differences in space, or space and differences in time, we can conceive of force as a property related to matter, or of matter as a property or condition related to force. Again, the distinction between "stress" and "intensity of stress" is unhappy. The authors define "stress" as "a force exerted at a surface of contact of two contiguous bodies, or at a section between two parts of the same body." What they call "intensity of stress" is what British engineers call "stress," or "force per unit area." This is the same thing as "intensity of force." The authors are not consistent in this matter, for they use the term "uniform stress" when they mean, in their terminology, "uniform intensity of stress." In view of the nature and purpose of the book the inconsistency is, however, of little moment or importance.

For the convenience of readers who keep reviews for reference, it is worth while to note how the space is filled—280 pages. Introductory, including systems of units, composition of forces and fundamental positions of space, time, and mass, 13 pages. Statics—forces in a plane, 45 pages; forces not in one plane, 23 pages; distributed forces, 23 pages. Centre of gravity, 25 pages. Moment of inertia, 48 pages. Kinetics—kinematics, kinetics of the particle, 44 pages. Work, power, and energy, 27 pages. Friction, 35 pages. Kinetics of rigid bodies having plane motion, only 62 pages. Impact, 16 pages. Index, 18 pages.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

PRO PATRIA.

[SEVENTH LIST.]

We present herewith a seventh list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Abney, Thos. W., assistant clerk, Grimsby Corporation, "Chums" Battalion, Grimsby, Lord Kitchener's Army.

Baxter, John R., engineering assistant, borough engineer's department, Grimsby Corporation, "Chums" Battalion, Grimsby, Lord Kitchener's Army.

Broadhead, Norman, late engineering assistant, borough engineer's department, Grimsby Corporation, Argyll and Sutherland Highlanders.

Brook, C. V., pupil of Mr. Andrew Warren, borough surveyor of Totnes, lance-corporal in the Royal Engineers at Chatham.

Clarke, J. H., engineering assistant, borough surveyor's department, Lancaster, 7th Battalion, Royal West Kent Regiment (Kitchener's Army).

Collins, John, assistant clerk, Grimsby Corporation, "Chums" Battalion, Grimsby, Lord Kitchener's Army.

Deas, Edwin H., engineering assistant, Dundee city engineer's department, Scottish Horse.

Ellis, A. R., clerk, Derby Corporation, 1st North Midland Field Ambulance, Royal Army Medical Corps.

Farrington, T. B., engineering assistant, Derby Corporation, 5th Battalion Notts and Derby Regiment (Territorials).

Fisher, Robert M., engineering apprentice, Dundee city engineer's department, Scottish Horse.

Fitzgerald, M. E., highway surveyor to the Warmley Rural District Council, South Midland Royal Engineers.

Forwell, Ernest S. W., engineering assistant, Dundee city engineer's department, Scottish Horse.

Hunter, Arthur T., engineering apprentice, Dundee city engineer's department, Scottish Horse.

Hutton, George M., engineering assistant, Dundee city engineer's department, Scottish Horse.

Keith, Lindsay S., clerk, Dundee city engineer's department, Scottish Horse.

Lawrence, Robert F., engineering assistant, borough engineer's department, Grimsby Corporation, Engineers' Units, Royal Naval Division.

Mason, Charles W., assistant clerk, borough engineer's department, Grimsby Corporation, "Chums" Battalion, Grimsby, Lord Kitchener's Army.

Michell, W. H., architectural assistant, Derby Corporation, Second Lieutenant, 12th Battalion Notts and Derby Regiment (Lord Kitchener's Army).

Milne, David S., engineering assistant, Dundee city engineer's department, Scottish Horse (motor cyclist).

Philip, Adam, engineering assistant, Dundee city engineer's department, Scottish Horse.

Weir, Francis B., clerk, Dundee city engineer's department, Scottish Horse.

Mr. Walton Maughan, Northampton, has joined the Royal Fusiliers.

Mr. A. B. Lowrie, of the Roads Improvement Association, has joined the Army Service Corps for the duration of the war.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Barking U.D.C. (October 2nd. Major J. Stewart). £4,300 for the purchase and fencing of land forming part of the Eastbury estate for purposes of a playing-field, and £5,250 for the widening and improvement of Ripple-road, Barking.—The acting surveyor, Mr. R. A. Lay, supplied details of the proposed schemes.

Bulkington U.D.C. (October 14th. Mr. R. G. Hetherington).—£8,500 for purposes of sewerage and sewage disposal.—Mr. F. C. Cook, engineer, said that, unfortunately, the undertaking was a costly one, having regard to the population of the district. The scheme would be ample for the requirements of Bulkington for many years to come. The inspector observed that Bedworth sewage works were close to Bulkington, and it had occurred to him that perhaps the Bulkington scheme might be worked in connection therewith. Dr. Bostock Hill, the county medical officer, pointed out that Bedworth was developing, and would probably require all the land at the sewage works for itself. Dr. Hill supported the scheme on behalf of the county council.

Chailey R.D.C. (September 29th. Mr. P. M. Crosthwaite).—£1,300 for the purpose of sewerage and sewage disposal for the village of Cooksbridge.—The engineer, Mr. H. Bertram Nichols, M.Inst.C.E., submitted the plans and explained them in detail. The scheme, he stated, was practically on the same lines as schemes he had carried out in two other districts with satisfactory results.

Darwen T.C. (October 13th. Major J. Stewart). £6,550 for the rebuilding of the public baths in Church-street, which were erected in 1854. The town clerk, Mr. W. P. Halliwell, stated that the accommodation provided would meet the requirements of the town for many years.

Lisburn R.D.C. (October 14th. Mr. P. C. Cowan). £5,000, to meet the extra expenditure incurred as compensation for wayleaves, arbitrators' and valuers' fees, and legal costs in connection with the Balmoral sewerage scheme. The total cost of the scheme was £13,500, and a loan of £8,500 had already been sanctioned and issued.—The inspector stated that he had inspected the work, which was very excellent, and would efficiently serve the purpose. Mr. James Hunter, engineer, gave details and the inquiry closed.

Yarmouth T.C. (October 13th. Mr. M. K. North). £4,140 for swimming baths, £4,500 for lawn and sea-shore promenade, and £16,000 for the extension of the Marine-parade North to the road leading to Caister Railway Station.—The borough surveyor, Mr. J. W. Cockrill, stated that baths would be placed on the gardens north of the Britannia Pier, and it would be a plain building of concrete, faced with glazed tiling. There was no bath accommodation in the town, and in proportion to the population there were fewer baths in the houses in the town than in any town in the country. With respect to the second scheme, the borough surveyor explained that it was an extension of the work done along the front, which formed one of the principal attractions and features of Yarmouth. These gardens also saved sand being blown on to the drive. He did not suggest in this scheme any gardening, but that the land be laid out simply as a lawn. As to the proposed road extension, it was stated that at the present time there were 4 miles of parade nearly completed in Yarmouth, and that if the scheme were carried out there would be 5 miles, from the harbour's mouth to Caister.

APPLICATIONS FOR LOANS.

Blaydon U.D.C. £2,350 for road schemes.

Bollington U.D.C. £350 for the purposes of the recreation ground and river diversion.

Christchurch T.C.—£800 for surface-water drainage.

Clayton West U.D.C.—£5,739 for sewerage and sewage disposal works.

Essex C.C. £2,620 for sinking a borehole and other works.

Hastings T.C. £1,298 for the purchase of six Candy patent filters and an aerating plant.

Magherafelt R.D.C. £15,430 for labourers' cottages.

Mansfield T.C.—£7,400 for the provision of working-class houses, and £4,000 for gas stoves.

Oldham T.C.—£8,255 for new bowling greens, laying out a recreation ground, and street improvement.

St. Ives T.C.—£1,188 for the Stennack-road improvement.

Southampton T.C.—£3,360 for the erection of workmen's houses.

Southport T.C. £25,000 for the electricity undertaking.

Taunton T.C. £3,000 for a swimming bath and slipper baths.

Walsall T.C.—£23,595 for electricity purposes.

LOANS SANCTIONED.

Aberdare U.D.C. £2,100 for a stores depot.

Axminster R.D.C.—£11,000 for sewerage and sewage disposal works.

Bedwas and Machen U.D.C.—£2,386 for the erection of a new council office.

Bermondsey B.C.—£2,000 for electricity mains and meters.

Blackwell R.D.C.—£20,000 for the Shirebrook housing scheme.

Bollington U.D.C.—£300 for laying gas mains.

Brierfield U.D.C. £500 for electricity mains and services.

Bromley T.C. £6,600 for widening Market square.

Bury T.C.—£1,400 in respect of street widening.

Chelmsford T.C.—£1,150 (repayable in sixty years) and £600 (repayable in fifteen years) for the purchase of land adjoining the sewage farm.

Cottingham U.D.C.—£2,900 for works of sewerage.

Disley R.D.C. £2,424 for works of sewage disposal.

Edmonton U.D.C.—£1,700 for road widenings.

Hipperholme U.D.C.—£1,475 for a road improvement.

Hythe T.C.—£300 for water mains extension.

Kirbymoorside R.D.C.—£6,049 for works of water supply.

Northwich U.D.C.—£304 for water main extension.

Oswestry R.D.C. £1,100 for works of water supply.

Paignton U.D.C.—£2,537 for the extension of the isolation hospital.

Shoreditch B.C.—£4,300 for road improvement.

Southampton T.C.—£27,350 for works of water supply, £20,350 for a reservoir, £2,000 for mains, and £5,000 for wells and headings.

Woking U.D.C. £5,800 for a housing scheme.

FORTHCOMING INQUIRIES.

OCTOBER.	£
26. **Wallasey.** For the erection of houses (Mr. Courtenay Clifton)	11,546
27.—**Arnold.** For the provision of a park (Mr. Edgar Dudley) .	3,500
27.—**Bispham.** For private street improvement (Mr. M. K. North)...	12,000
27. **Bournemouth.** For the undercliff improvement (Mr. P. M. Crosthwaite)	5,000
27.—**London.** For an improvement scheme (Mr. W. H. Collin)	
27.—**Sedbergh.** For the erection of houses (Mr. Courtenay Clifton)	3,200
27.—**Sheringham.** For surface-water drainage (Mr. R. H. Bicknell)	900
27.—**Winchcomb.** For the erection of houses (Mr. H. S. Stewart)	2,565
28. **Chorley.** For laying granite setts and private street works (Mr. M. K. North)	8,663
28.—**Haywards Heath.** For laying out a cemetery (Mr. R. H. Bicknell)	500
28. **Swindon.** For works of sewage disposal (Mr. P. M. Crosthwaite)	33,000
29.—**Harrogate.** For private street improvement (Mr. M. K. North)	2,177
29.—**Llantrisant.** For works of sewage disposal (Mr. P. M. Crosthwaite)	9,500
29. **Petersfield.** For street improvement (Mr. R. H. Bicknell) . .	180
29. **St. Albans.** For the erection of houses (Mr. H. S. Stewart)	1,300

Municipal Work in Progress and Projected.

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The following are among the more important projected works, of which particulars appear below: Buildings—Cambridge; Pavilions, housing and town planning—Blackwell, Mansfield, Whitehaven, Wombwell; roads and materials—Bermondsey, Grimsby, Stoke-on-Trent, Watford; sewerage and sewage disposal—Coatbridge, Kidderminster; water, gas and [illegible]—Colwyn Bay, [illegible], Birmingham, Southport. Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Cambridge T.C.—The council have approved the estimate of £5,500, prepared by the borough surveyor, Mr. J. Jackson, for the proposed additions to the Guildhall, and the necessary steps have been taken to obtain the sanction of the Local Government Board to the scheme. In addition, there will have to be paid sums of £441 and £470, architect's fees and quantity surveyor's charges in respect of plans which were subsequently abandoned.

Dunstable T.C.—The Sanitary Committee have been instructed to report upon a suitable site for an isolation hospital.

Perthshire C.C.—The question of securing a site suitable for a county sanatorium has been referred to the Finance Committee.

Pwllheli T.C.—The council on Wednesday adopted a scheme for erecting a sea wall, parade, and road between South Beach and West-end Parade, at a cost not exceeding £4,000.

Wallsend T.C.—The borough surveyor, Mr. G. Hollings, has prepared plans for the extension of the hospital, at an estimated cost of £2,000.

HOUSING AND TOWN PLANNING.

Bampton U.D.C.—The surveyor, Mr. W. F. Siddalls, reported recently that Mr. Collins, Local Government Board inspector, visited the town on September 17th, and expressed the opinion that more houses were required in Bampton. He also suggested that the council should take steps to find out a good water supply for these houses and prepare plans for the Local Government Board. The inspector appeared pleased with what were termed "the satisfactory houses," of which there were about fifty in the district.

Birmingham T.C.—The council on Tuesday approved the Town Planning Committee's scheme for the North Yardley and Stechford area, and authority was given for the preparation of a scheme for the adjoining South Birmingham area.

Blackwell R.D.C.—The Local Government Board have sanctioned the scheme for the erection of 100 houses at Shirebrook, and for the purchase of the necessary land. The total cost will be £20,000, and sanction was given for the repayment of this amount over the number of years asked for.

Kilsyth T.C.—The council have abandoned the proposal to build tenement houses, and have decided to proceed on the semi-detached cottage system, proposing to build on the tenant-proprietorship principle, which it is expected will be sanctioned by the Government. Competitive plans were under consideration by the Property Committee, who selected one showing a house comprising kitchen, parlour, bedroom, bath-room, pantry, and coal cellar with wash-house outside. There are about nine and a-half houses to the acre. This plan has met with the approval of the Local Government Board in its general principles.

Launceston T.C.—The council on Monday decided to proceed with a modified scheme for the erection of six houses, at a cost of £1,383. The rent will be £13 a year, and the houses will be self-supporting.

Mansfield T.C.—It has been decided to erect on land in Baums-lane forty houses in blocks of four each, half of them to comprise living-room, scullery, two bedrooms, and necessary out-offices, and half of them living-room, scullery, three bedrooms, and necessary out-offices, in accordance with the plans submitted by the borough surveyor, Mr. T. P. Collinge; the smaller houses to be let at 4s. 6d. per week, and the larger at 5s. per week. It was stated that the estimated annual charge of the scheme upon the [illegible] £18. The cost of the land is £975, building £6,000 and street construction £425.

Middlesbrough T.C.—Consideration is being given to schemes for working-class dwellings, which have been submitted by the borough surveyor, Mr. S. E. Burgess.

Newton Abbot U.D.C.—The council have agreed to inform the Local Government Board that twenty houses are required in the district.

Oswestry R.D.C.—The council have passed plans for the laying out of a garden suburb at Weston Rhyn, a colliery village near Oswestry. The site is large enough for the erection of from seventy to eighty cottages. Each house will have a bath-room.

Prestwich U.D.C.—The council are seeking the sanction of the Local Government Board to a scheme for the provision of eighteen workmen's houses.

Whitehaven T.C.—A scheme has been approved for the erection of ninety-six working-class dwellings.

Wombwell U.D.C.—The question is under consideration of building 100 workmen's houses in Wombwell and Hemingfield.

PARKS AND OPEN SPACES.

Briton Ferry U.D.C.—The Local Government Board have approved the plans of the surveyor, Mr. H. A. Clarke, for laying out the park at Neath-road, and have issued their sanction for the borrowing of £1,800 without holding a public inquiry.

Kirkby U.D.C.—£130 of the sum given by the Duke of Portland is to be expended in laying out the East Ward recreation ground.

Weston-super-Mare U.D.C.—The council have approved a sketch plan submitted by the surveyor, Mr. H. A. Brown, for an improvement of the Beach Lawns between Regent-street and Oxford-street, and Mr. Brown has been authorised to carry out the works when convenient.

ROADS AND MATERIALS.

Bermondsey B.C.—The council have submitted to the Road Board a number of road schemes estimated to cost £20,000.

Bristol T.C.—The city engineer, Mr. L. S. McKenzie, reported recently that the Road Board had definitely intimated that they would grant £1,000 towards the cost of widening Avonmouth-road between West Town-road and Cook-street, and £800 towards the cost of widening Gloucester-road between the barracks and the city boundary, the grants in each case being one-third of the cost of the works, exclusive of the purchase of the necessary land. They also stated that the Local Government Board had intimated that it was desirable to set in motion road improvement works in Bristol to provide employment, and asked that the Avonmouth-road work be now put in hand, leaving the date for commencing the Gloucester-road work to the discretion of the corporation.

Chard R.D.C.—A resolution has been passed to call the attention of the Works Committee of the county council to the need for effecting an improvement in front of Park-terrace, Crimchard, by widening the road, the land for which has already been given.

Chesterfield T.C.—Properties costing £13,463 are to be purchased for the Lordsmill-street and Vicar-lane improvement schemes.

Cornwall C.C.—The county surveyor, Mr. L. W. Thompson, submitted recently a report to the Main Roads Committee on the proposed new road to Mevagissey, and he was authorised to proceed with the necessary engineering arrangements.

East Lothian C.C.—In connection with the scheme for the construction of an improved road over the Lammermoor Hills, plans have been prepared for a deviation round the hill known as the "Hungry Snout," at an estimated cost of £1,000. It is under-

stated that the cost will be covered by a grant from the Road Board.

Edmonton U.D.C.—Contributions amounting to £523 will be made by the Road Board and the Local Government Board towards the cost, estimated at £11,200, of the Silver-street improvement.

Flaxton R.D.C.—The council have submitted to the Road Board a number of road improvement schemes, which, it is estimated, will cost £2,523.

Grimsby T.C.—Towards the Weelsby-road improvement, estimated to cost £19,000, a grant of £5,000 has been sanctioned by the Local Government Board.

Harwich T.C.—It is announced that the Road Board have sanctioned a grant of £1,000, half the cost of widening Frankswood, Harwich.

Hollingbourne R.D.C.—The tender of Messrs. Chittenden & Simonds has been accepted for steam rolling, their prices being 2s. 10d. per hour, and scarifying at 3s. per 100 yds. The tender of Messrs. Denniss, Paine & Co. has been accepted for tools, as follows: Brooms, 35s. 6d. per dozen; ash handles, 3s. 6d. per dozen; shovels, 49s. 6d. per dozen; stone forks, 63s. per dozen; picks, 2s. 2d. each; pick handles, 7s. 6d. per dozen.

Plympton R.D.C.—Estimates are to be prepared of the cost of the improvement to the district roads asked for by the military authority in connection with the camps and forts in the neighbourhood, and the council will apply to the Road Board to meet the cost of the works.

Rotherham T.C.—The borough engineer, Mr. E. B. Martin, has received instructions that when the tramway is laid in Cranworth-road wood setts are to be put down between Effingham-square and Howard-street.

St. Ives T.C.—The council have accepted an offer from the Road Board of a grant of £594 and a loan of £1,188, free of interest, and repayable in annual instalments in five years, towards the cost of the proposed Stennack-road improvement, the period of repayment to be extended to seven years, provided the county council would take over the thoroughfare as a main road.

Stoke-on-Trent T.C.—The Road Board have sanctioned a grant of £5,000 towards the cost of improvement of Federation-road, Burslem (estimated to cost £4,682); the conversion of Waterloo-road from North-road, Cobridge, to the new town hall, Burslem, from a macadam road into a sett-paved road (£11,113); Trentham-road (widening and storm sewers, £1,067); and Stone-road diversion at Longton (£2,347).

Watford U.D.C.—High-street and London-road are to be paved with wood, at an estimated cost of £20,575.

Weston-super-Mare U.D.C.—It has been agreed to carry out the proposed street improvement and contingent works in Birnbeck-road, for which plans were prepared by the surveyor, Mr. H. A. Brown.

Wigan T.C.—With the view of providing work for the unemployed the General Purposes Committee have resolved to proceed with proposals for making a road from Whelley to Wigan-lane, and the continuation of the Kenyon-road to Spencer-road. The Local Government Board have been written to inquiring whether the work could be included in the scheme sanctioned by the board for the relief of unemployment.

SEWERAGE AND SEWAGE DISPOSAL.

Barnet R.D.C.—It has been resolved to carry out an enlargement of the contact beds at the sewage disposal works by direct labour, under the supervision of the surveyor, Mr. A. J. Wilshire.

Bath R.D.C.—A letter has been received from the Local Government Board approving generally the council's scheme for the disposal of the sewage of Freshford.

Bexhill T.C.—A scheme has been approved for dealing with the storm-water from the Cooden beach sewer, at an estimated cost of £680. The scheme of the surveyor, Mr. G. Ball, for lengthening the outfall at Galley Hill has been referred to a special committee for report.

Coatbridge T.C.—The council have approved a scheme of sewage disposal which is estimated to cost £30,000.

Congleton R.D.C.—A scheme of sewage disposal is to be carried out, at an estimated cost of £2,100.

Kidderminster T.C.—Messrs. Willcox & Raikes have prepared plans and estimates for a sewerage and sewage disposal scheme, for which the council are recommended by the Drainage Committee to borrow £31,000.

Norwich T.C.—The council agreed on Tuesday that the main carrier from the sewage tanks at the Whitlingham Farm should be covered in with reinforced concrete slabs, at an estimated cost of £140, and that the necessary work should be put in hand to enable an additional 2½ acres of land adjacent to the main carrier to be irrigated, at an estimated cost of £30. It was also decided to accept the quotation of Messrs. Tangyes to rebore the four liners of the gas engines at Trowse sewage pumping station and fit new plain pistons instead of water-cooled pistons, for the sum of £82 less 2½ per cent, carriage to and fro extra.

Rochford R.D.C.—The council have requested Mr. E. J. Silcock, M.INST.C.E., of Westminster and Leeds, to advise them on the question of the sewerage and sewage disposal of South Benfleet.

Stockport T.C.—The council on Wednesday approved, on the recommendation of the Sewage Outfall Committee, of an agreement for the reception and treatment by the Manchester Corporation of the sewage of the borough up to six times the dry-weather flow. The Stockport Corporation have had under consideration a scheme to extend their sewage works at an estimated cost of £60,000, and to take in the sewage of the Heaton Norris district. It is now estimated that the cost of the extension, in order to deal adequately with the sewage of the whole of the borough, including Heaton Norris, would be close upon £100,000, which is held to be prohibitive; hence the agreement with the Manchester Corporation.

Tavistock R.D.C.—The council have referred two schemes of drainage outfall for Whitchurch to the parish council, and also invited tenders for carrying out drainage works at Lydford.

WATER, GAS, AND ELECTRICITY.

Batley T.C.—Subject to the sanction of the Local Government Board, the council have accepted the tender of the Turnover Filter Company, of Belfast, for the supply, erection, and completion of a water purification plant for the baths. The firm guaranteed that the plant would cleanse both ponds in six hours.

Chapel-en-le-Frith R.D.C.—Messrs. Brady & Partington have prepared a scheme for intercepting the springs on the Nook Farm estate, and pumping the water above the Nook, whence it will flow by gravitation to the mains at Fernilee. The estimated cost of the works is £3,200.

Cheadle R.D.C.—The council have approved a water supply scheme for Warrington, estimated to cost £14,410.

Colwyn Bay U.D.C.—The council have approved the plans of the surveyor, Mr. W. Jones, for a service reservoir which is to be constructed on the top of the high land near Mochdre recently acquired. The land occupied by the reservoir will comprise 7 acres, and the reservoir will have a capacity of 11,000,000 gallons. The value of the land set apart for the reservoir was put at £455, and the rest of the estate, which will be used for a public park, was valued at £205. A loan for these amounts is to be obtained.

Essex C.C.—The council have approved a scheme for sinking a second borehole at Severalls Asylum, and for installing machinery for lifting the water to a tank.

Haddington T.C.—A scheme has been prepared by Mr. Carfrae for the construction of a reservoir for the conservation of part of the water which runs to waste in the catchment areas. It will have a capacity for a three days' supply.

Hastings T.C.—The council have decided to instal six filters at the Filsham pumping station, together with an aerating plant, at a cost of £4,298, and to apply to the Local Government Board for the necessary loan.—It has been agreed to adopt the suggestion of the Local Government Board to defray the cost of laying electric cables on the Brisco estate out of the loan of £5,000 previously sanctioned for prospective expenditure on mains, instead of having another loan of £1,185 for the work.

Keith T.C.—It is proposed to construct a concrete reservoir at Cathie Hill, subject to a loan being obtained for the cost.

Middlesbrough T.C.—The council have agreed to [illegible] the North Ormesby gas undertaking for £[illegible].

Perthshire C.C.—In connection with the Stanley special water supply district it has been decided to lay a new 6-in. pipe from the Cowford reservoir towards Stanley, alongside the existing pipe at an estimated cost of £1,200.

Selby R.D.C.—A letter was read on Monday from the Local Government Board again calling attention to the remarks of the former medical officer to the council (Dr. Stedman) as to the need of a water supply for the villages of Haddlesey, Carlton, Camblesforth, Drax, and Burn, and inquiring the present position of the proposed scheme. The letter also drew attention to the medical officer's report on the unsatisfactory supply at Wistow. It was stated in the course of the discussion that the pipes would now cost 50 per cent more than before the war. A resolution was carried that the scheme be adjourned till after the war.

MISCELLANEOUS.

Birmingham T.C.—The council on Tuesday adopted a scheme for the construction of new tramways and the purchase of additional rolling stock.

Haywards Heath U.D.C.—The seal of the council has been fixed to the conveyance of the site for the proposed cemetery.

Southport T.C.—The General Purposes Committee have accepted a scheme submitted by the Parks and Foreshore Committee, for the development of the sea front. The estimated cost of the alterations and improvements is about £20,000. The works include the widening of the marine drive, the erection of a wall 5 ft. in height on the inner side of the drive, to enclose to a large extent what is known as the "lagoon site," and the construction of two bowling greens and an open-air concert pitch in the North Marine Park.

Todmorden T.C.—A new motor fire engine purchased by the council was tested lately in the presence of a large company. The engine is of the petrol-driven Merryweather "Hatfield" type, and delivers 450 gallons per minute.

PERSONAL.

Mr. Edward Brennan, Rushall, has been appointed assistant county surveyor by the Queen's County Council.

Mr. C. E. Fox, architect and surveyor, of Halifax, has accepted the appointment of consulting surveyor to the Southowram Urban District Council.

Mr. John Rorke, county surveyor of Queen's County, has resigned, and the county council are advertising for a successor at a salary of £350 a year.

Mr. John Morgan has been appointed temporary surveyor to the Blaenavon Urban District Council during the absence of the surveyor, Mr. E. W. Edwards, on active service.

Mr. W. G. Powell has been appointed first assistant in the city engineer's department, Norwich, at a salary of £175 per annum, and Mr. R. A. Winfield second assistant.

Messrs. W. A. Burn, borough surveyor's office, Taunton, and J. W. Moncur, M.INST.C.E., borough engineer of Sunderland, have been elected members of the Royal Sanitary Institute.

Mr. Charles Herbert, assistant to Mr. G. Riley, surveyor to the Wellington (Salop) Urban District Council, has been appointed assistant in the surveyor's department, East Suffolk County Council.

Mr. E. A. Aston, who has been acting as honorary secretary of the Dublin Mansion House Committee of the National Relief Fund, has been appointed an inspector of the Local Government Board for Ireland.

Mr. H. M. Bennett, sanitary surveyor to the Warmley Rural District Council, has been appointed a representative of the council to attend the conference in Bristol on National Housing and Town Planning.

Mr. Vincent J. Willis, assistant surveyor to the Morecambe Corporation, was on Friday last appointed assistant engineer in the borough engineer's department of Halifax. He served his articles to Mr. J. W. Hipwood, ASSOC.M.INST.C.E., borough surveyor of Morecambe, and was subsequently appointed assistant surveyor by the council, which position he has held for the past three years.

Mr. Henry Wood, ASSOC.M.INST.C.E., M.R.SAN.I., associate member of the Institution of Municipal and County Engineers, was at Tuesday's meeting of the Norwich City Council appointed deputy city engineer in succession to Mr. Harold Collins, ASSOC.M.INST.C.E., the recently appointed borough engineer and surveyor of Colchester. Mr. Wood was articled to Mr. A. H. Mountain, M.INST.C.E., civil engineer, Manchester. He was subsequently appointed assistant engineer to the Heaton Norris Urban District Council, and afterwards held a similar position under the Swinton and Pendlebury Urban District Council. Mr. Wood became an assistant in the office of the city engineer of Norwich in 1903, and since that time has held the positions of courts and yards surveyor, general assistant, and chief assistant.

Town Planning at Ruislip-Northwood.—A town planning inquiry was held recently at the Ruislip-Northwood Urban District Council offices by Mr. G. L. Pepler, F.S.I., Local Government Board inspector, as to the second scheme of town planning for this council. The inquiry was well attended, and the necessary evidence in support of the scheme was given by Mr. W. Louis Carr, surveyor to the council. The second scheme comprises a number of detached areas, about 600 acres in all, and includes parts of two rural districts.

Unemployment and Road Schemes.—It was reported at the meeting of the Essex County Council recently that the Road Board had undertaken that if approved schemes of road improvement were put in hand in consequence of an intimation from the Local Government Board that relief works were required in particular districts on account of unemployment caused by the war, the Road Board would provide the whole of the money for the carrying out of these. It was mentioned that the county surveyor had prepared road schemes involving an estimated expenditure of £22,300, one of these being the widening of the Epping New road.

FOR OTHER ADVERTISEMENTS
See End of Paper.

ATHERSTONE RURAL DISTRICT COUNCIL.

SURVEYOR'S DEPARTMENT.

Applications are invited for the position of Assistant to the Engineer and Surveyor. Salary at the rate of £100 per annum. Applications, with copies of not more than three recent testimonials, to be sent to me on or before Monday, 2nd November, 1914.

H. J. COLEBY,
Engineer and Surveyor.

102 Long street,
Atherstone. (2,037)

THE IRLAM URBAN DISTRICT COUNCIL invite applications for the position of a capable Engineering and Surveying Assistant.

Form of Application and any particulars desired may be obtained from Mr. R. H. Winterbottom, Surveyor, Council Offices, Irlam. (2,036)

METROPOLITAN BOROUGH OF ISLINGTON.

PAVING WORKS.

Tenders are invited for Paving with Granite Setts and Wood Blocks the macadamised portions of the carriageway of Camden-road, between Brecknock-road and Parkhurst-road, and of Parkhurst-road.

Conditions and Specification may be seen, and Forms of Tender and Bills of Quantities obtained, on and after Friday, the 30th instant, upon application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, N., on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender and the return of the whole of the documents issued.

Sealed Tenders, endorsed "Tender for Paving Works," must be received by the undersigned not later than 4 p.m. on Tuesday, the 10th November, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

C. G. E. FLETCHER,
Town Clerk.

Town Hall, Upper-street, N.
October, 1914. (2,035)

SURVEYORS' INSTITUTION.

ARRANGEMENTS FOR FORTHCOMING SESSION.

The session of the Surveyors' Institution will open on November 9th, when the president, Mr. Howard Chatfeild Clarke, will give his presidential address. The gold medal essay, by the course in respect of the best paper read during the previous session, will be presented to Percy W. G. Fennessey on the paper of his paper on "The Part Played by Water in Modern Road Construction."*

Ordinary general meetings will be held on November 23rd, December 14th, January 11th and 25th, February 9th and 22nd, March 8th, April 12th and 26th, and May 10th.

On November 23rd Mr. Edwin Saville will read a paper on "The Home-grown Wheat Supply Available in War Times." The remainder of the session will be taken up in discussing the acquisition of land for public purposes, introduced by Mr. Andrew Young and Mr. L. O. Mathews; land tenure, introduced by Mr. Joshua Bury and Mr. J. G. Head; rating, introduced by Mr. Isaac Dickson and Mr. E. H. N. Ryde; and housing, introduced by Mr. Strachan Gardiner and another.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

EASTERN AND NORTH-EASTERN DISTRICTS.

An Eastern and North-Eastern District meeting will be held at Lincoln on Saturday, October 31st.

PROGRAMME.

11.45 a.m.—Meet at Guildhall. Short business meeting.

12.45 p.m.—Luncheon, at moderate charge.

1.30 p.m.—Leave for water tower, inspecting en route objects of antiquarian interest, including the old Roman city and the cathedral. Mr. T. Francis Hewitt (member), of the city engineer's department, will afford the members information on these.

2.45 p.m.—Leave water tower, when visitors will divide into two parties, one party visiting the gas and electricity works and tramway undertakings, and [illegible] places en route, the other visiting the Bracebridge reservoir and the sewage disposal works.

4.45 p.m.—Tea.

The city engineer and surveyor, Mr. R. A. MacBrair, M.INST.C.E., the electrical engineer, Mr. Stanley Clegg, M.I.E.E., the waterworks engineer, Mr. Horobin, and the gasworks engineer, Mr. John Carter, have kindly granted all facilities for visiting the various undertakings, and will, if possible, conduct the parties round or arrange for their deputies to do so.

G. BELSON CHILVERS,
Hon. District Secretary.

Meetings will be held at Newcastle on Saturday, November 7th, and December 12th.

B. WYANE,
39 Victoria-street, S.W. *Secretary.*

Disinfecting Apparatus.—A correspondent asks for the names of makers of disinfecting apparatus. Address "A," c/o The Editor.

The London and Lancashire Fire Insurance Company, Limited, announce that, as from Monday last, their London office address will be 155 Leadenhall-street, E.C. Their old premises in King William-street have long since been outgrown, and the continuous increase in the number of the clerks required to deal with the company's steadily expanding business has necessitated a portion of the staff being housed in various temporary offices in other parts of the City. The inconvenience of this arrangement made it imperative to seek new quarters, and the handsome building now approaching completion in Leadenhall-street is the result.

* This paper, together with a full report of the discussion which followed its reading, appeared in THE SURVEYOR of November 28 and December 19, 1913.

SHEFFIELD CITY ENGINEER'S DEPARTMENT.

The appointment of Mr. W. J. Hatherley, surveyor of highways and deputy city surveyor, as city surveyor of Sheffield is, we are given to understand, a permanent and not a temporary one, as we stated to be the case last week. A passage in the report of the Special Committee dealing with the rearrangement of the city engineer's department stated that "officers of the corporation whose responsibilities are increased by the above arrangements are to be informed that their new appointments are temporary only," but this condition was evidently not intended to apply to Mr. Hatherley.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SANITARY INSPECTORS. October 26th. Finsbury Borough Council. £150—£200 per annum.—Mr. G. W. Preston, town clerk, Town Hall, Rosebery-avenue, E.C.

JUNIOR SURVEYING ASSISTANT. — October 26th. Corporation of Bexley. £90 per annum. Mr. S. Parker, town clerk.

ARCHITECTURAL ASSISTANT.—October 26th.—Corporation of Ealing. £2 10s. per week.—Mr. W. R. Hicks, Town Hall.

ASSISTANT INSPECTOR OF NUISANCES.—October 26th.—Corporation of Warrington. £78—£125 per annum.—Health Department.

SURVEYOR OF HIGHWAYS.—October 27th.—Docking Rural District Council. £80 per annum.—Mr. J. A. Stoughton, clerk, Fakenham.

INSPECTOR OF NUISANCES.—October 27th.—Bexley Urban District Council. £150 per annum.—Mr. T. G. Baynes, clerk.

SURVEYOR'S ASSISTANT.—October 27th.—Atherton Urban District Council. £2 per week.—Mr. William Garnett, clerk.

HOUSING INSPECTOR.—October 28th.—Scarborough Rural District Council. £80 per annum.—Mr. J. W. Read, clerk, 14 Dean-road, Scarborough.

ENGINEERING AND SURVEYING ASSISTANT.—October 28th.—Corporation of Huddersfield. £120 per annum.—Mr. K. F. Campbell, borough engineer and surveyor.

TEMPORARY SURVEYOR AND INSPECTOR.—October 28th.—Swaffham Urban District Council.—Mr. Alfred J. Winter, clerk.

JUNIOR ASSISTANT.—October 29th.—Corporation of Leigh. £72 per annum.—Chairman of the Highways Committee, Town Hall, Leigh, Lancs.

ASSISTANT SURVEYOR.—October 29th.—Antrim County Council. £125 per annum.—Mr. A. Millar, deputy secretary, County Court House, Belfast.

TEMPORARY ASSISTANT.—October 31st.—Walton-upon-Thames Urban District Council. £2 2s. per week.—Mr. R. Wilds, surveyor.

INSPECTORS.—October 31st.—Rhymney Valley Sewerage Board. £2 10s. to £3 per week.—Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, S.W.; or Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

TEMPORARY ASSISTANT.—October 31st.—Somerset County Council. £3 3s. per week.—Mr. Edward Stead, county surveyor, Wells, Somerset.

TEMPORARY ASSISTANT ROAD SURVEYOR.—October 31st.—Gloucestershire County Council.—County Surveyor, Shire Hall, Gloucester.

JUNIOR CLERK.—October 31st.—The Maldens and Coombe Urban District Council. £1 per week.—Mr. R. H. Jeffes, engineer and surveyor, Council Offices, New Malden.

INSPECTOR OF NUISANCES.—October 31st.—Cowbridge Rural District Council. £90 per annum.—Mr. J. Stockwood, clerk, Cowbridge, Glamorgan.

ASSISTANT SURVEYOR.—November 2nd.—West Riding Highways Committee. £150 per annum.—Mr. F. G. Carpenter, West Riding surveyor, County Hall, Wakefield.

INSPECTOR OF NUISANCES.—[illegible] Mr. J. Marsh, clerk.

ASSISTANT ENGINEER AND SURVEYOR.—[illegible]

INSPECTOR OF NUISANCES.—[illegible] Mr. [illegible]

DISTRICT ROAD SURVEYOR.—[illegible] expenses.—Mr. D. Mackenzie, district clerk, Torridon.

SEWAGE WORKS MANAGER.—[illegible] Mr. H. Ellis, town clerk.

TEMPORARY ASSISTANT.—Staffordshire County [illegible]

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SOUTHEND.—December 4th.—Schemes for a [illegible] hospital, for the corporation. Premiums [illegible] Mr. E. J. Elford, borough engineer.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HAMPSHIRE.—October 26th.—For the extension of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

OYSTERMOUTH.—October 26th.—For the construction of reinforced-concrete service reservoir and filter tanks, for the urban district council.—Mr. W. P. Puddicombe, surveyor.

HASTINGS.—October 26th.—For the extension of a public convenience, for the corporation.—Mr. P. H. Palmer, borough engineer.

INVERNESS.—October 26th.—For the erection of a hall and other works at a school, for the School Board.—Mr. J. H. Gall, architect, Lombard-street.

HENDON.—October 26th.—For the construction of [illegible] and convenience, for the urban district council.—Mr. S. S. Grimley, surveyor.

MANCHESTER.—October 26th.—For the erection of a tramway shelter and convenience, for the corporation.—City Architect, Town Hall.

COVENTRY.—October 26th.—For the erection of a shed at the destructor premises, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

WEST HAM.—October 27th.—For the extension of the asylum, Goodmayes, Essex, for the corporation.—Borough Engineer, Town Hall.

OLDHAM.—October 27th.—For the extension of a car shed, for the Tramways Committee.—Borough Surveyor.

ROXBURGH.—October 27th.—For widening and repairing a bridge, for the county council.—Mr. G. S. Carfrae, 1 Erskine-place, Edinburgh.

COOKHAM.—October 27th.—For the demolition of existing bridge and building a new bridge, for the rural district council.—Mr. W. Weed, clerk, Queen-street Chambers, Maidenhead.

LEYTON.—October 27th.—For constructional work at the sewage disposal works, for the urban district council.—Mr. E. H. Essex, Town Hall.

KEIGHLEY.—October 27th.—For extensions to electricity station, for the corporation.—Mr. H. Webber, borough electrical engineer and tramways manager.

ILFORD.—October 27th.—For the erection of buildings and boundary wall, for the urban district council. Mr. H. Shaw, engineer and surveyor.

WOOD GREEN.—October 28th.—For the extension of caretaker's cottage, for the urban district council. Mr. C. H. Crosford, architect to the Education Committee.

MANCHESTER.—October 28th.—For the erection of a laboratory, pumproom and other works, for the Sanitary Committee.—City Architect, Town Hall.

GLASGOW.—October 28th.—For extensions to a hospital, for the corporation.—Mr. J. Lindsay, town clerk.

OLDHAM.—October 29th.—For building and steelwork required for the extension of a car shed, for the corporation.—Borough Surveyor.

BELPER.—October 29th.—For the construction of a culvert, for the rural district council.—Mr. R. C. Cordon, surveyor.

EXETER.—October 29th.—For extensions to the municipal offices, for the corporation.—City Surveyor.

HAWARDEN.—October 30th.—For the erection of a public convenience, for the rural district council.—Mr. L. F. Wilson, Westfield, Abermorddu, near Wrexham.

LUTON.—October 31st.—For the erection of eight cottages, for the rural district council.—Mr. H. Pickering, 18 Princes-street, Dunstable.

LINDSEY.—October 31st—November 19th.—For the erection of a school, for the Education Committee.—Messrs. Scorer & Gamble, architects, Bank-street Chambers, Lincoln.

EAST HAM.—October 31st—November 17th.—For the erection of a school and dining hall, for the Education Committee.—Mr. R. L. Curtis, architect, 11-12 Finsbury-square, London, E.C.

MIDLETON.—October 31st.—For the erection of eleven cottages, for the rural district council.—Mr. J. Stanton, clerk, Midleton, Ireland.

RUGBY.—November 2nd.—For the erection of a disinfecting chamber, for the urban district council. Mr. J. H. Sharp, surveyor.

GREENWICH.—November 2nd.—For the erection of a dispensary, for the borough council.—Mr. A. Roberts, architect, 92 London-street, Greenwich.

HERTS.—November 2nd.—For demolition of existing bridge and building a new bridge, for the county council.—County Surveyor, Hatfield.

PRESTON.—November 3rd.—For the erection of a cottage, for the Joint Hospital District.—Mr. W. D. T. Munford, architect, 12 Guildhall-street, Preston.

WANDSWORTH.—November 3rd.—For the construction of underground conveniences, for the borough council.—Borough Engineer, 215 Balham High-road, S.W.

MANSFIELD.—November 3rd.—For the erection of three hospital pavilions, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

EAST STOW.—November 4th.—For the erection of working-class dwellings, for the rural district council.—Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

COLWYN BAY.—November 4th.—For the construction of a sliding table and lift for lowering and raising railway wagons, for the urban district council. Mr. J. Smith, Gas Offices, Colwyn Bay.

OSWESTRY.—November 9th.—For laying mains, sluice valves, and fire hydrants at waterworks, for the rural district council.—Messrs. Barrington, Son & Watney, Prudential Chambers, Wolverhampton, and 22 Victoria-street, Westminster.

CROYDON.—November 10th.—For supplying deep well pumping engine and pumps at waterworks, for the corporation.—Borough Engineer.

LANCASHIRE.—November 10th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

LOUGHBOROUGH.—For the erection of a boundary wall, for the corporation.—Mr. A. H. Walker, borough surveyor.

Iron and Steel.

LONDON.—October 30th.—For the erection of steel-work at gear store, for the Metropolitan Water Board.—Engineer, Savoy-court, Strand, W.C.

Roads.

WANDSWORTH.—October 26th.—For making up certain streets, for the borough council.—Mr. P. Dodd, borough engineer.

YORK.—October 26th.—For the construction of about 418 lin. yds. of new road, 50 ft. wide, for the corporation.—Mr. F. W. Spurr, city engineer.

HARROGATE.—October 26th.—For the execution of private street works, for the corporation.—Mr. C. E. Rivers, borough surveyor.

MANSFIELD.—October 26th.—For making up a new street, for the Education Committee.—Mr. T. P. Collinge, borough engineer and surveyor.

HENDON.—October 26th.—For private street works, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

TYNEMOUTH.—October 26th.—For the supply of whinstone paving setts, for the corporation.—Mr. J. F. Smillie, borough surveyor.

RAWMARSH.—October 27th.—For making up a street, for the urban district council.—Mr. J. A. Tonge, surveyor.

BELFAST.—October 27th.—For the supply of setts, for the corporation.—Mr. Hector F. Gullan, City Hall.

KEIGHLEY.—October 27th.—For works of kerbing, channelling and flagging, for the rural district council.—Mr. Thomas Burton, surveyor.

WILLESDEN.—October 27th.—For road-making and paving works, for the urban district council.—Mr. O. C. Robson, engineer, Municipal Offices, Dyne-road, Kilburn.

GOSFORTH.—October 27th.—For making up certain streets, for the urban district council.—Mr. George Nelson, surveyor.

ROCHDALE.—October 28th.—For making up certain streets, for the corporation.—Borough Surveyor.

LANCHESTER.—October 28th.—For making up certain streets, for the rural district council.—Highway Surveyor.

SUTTON (Surrey).—October 28th.—For the supply of a 6-ton steam roller, which must be capable of being converted into a tractor, for the urban district council.—Mr. W. Hedley Grieves, engineer and surveyor.

NORTH DARLEY.—October 30th.—For the supply of 1,000 tons of granite, for the urban district council.—Mr. E. F. Lowe, surveyor, Darley Dale, Matlock.

JOHANNESBURG.—October 30th.—For the supply and delivery of four tar-spraying machines, for the municipal council.—Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

WALMER.—October 31st.—For the supply of 500 cub. yds. of clean flints, for the urban district council.—Mr. W. Barker, surveyor.

DEVIZES.—October 31st.—For works of scarifying and steam rolling, for the rural district council.—Mr. S. W. Saunders, surveyor.

HAMPTON WICK.—October 31st.—For the supply of broken granite, for the urban district council.—The Surveyor.

SALISBURY.—October 31st.—For constructing a tar-macadam footpath, for the District Joint Isolation Hospital.—Mr. F. Hodding, clerk, Market House Chambers, Salisbury.

SUNBURY-ON-THAMES.—November 2nd.—For road widening and reconstruction, for the urban district council.—Mr. H. F. Coales, engineer.

WHITLEY AND MONKSEATON.—November 2nd.—For works of public and private improvement, for the urban district council.—Mr. A. J. Rousell, surveyor, Whitley Bay.

ROTHWELL.—November 2nd.—For laying concrete foundations and paving with granite setts, for the urban district council.—Mr. J. Southwart, surveyor.

SOUTHALL-NORWOOD.—November 2nd.—For the supply of road materials, for the urban district council.—Mr. R. Brown, engineer and surveyor, Town Hall, Southall.

THE MALDENS AND COOMBE.—November 3rd.—For making-up work and paving with artificial slabs, for the urban district council.—Mr. R. H. Jeffes, Municipal Offices, New Malden.

CARSHALTON.—November 4th.—For the supply of granite, granite chippings, and hire of steam roller, for the urban district council.—Mr. W. Willis Gale, surveyor.

LARNE.—November 4th.—For work of road construction, for the rural district council.—Mr. T. Nelson, clerk.

CAMBRIDGESHIRE.—November 4th.—For the supply of broken granite, basalt, slag, and tarred macadam during the year ending March 31, 1916, for the county council.—The Clerk, County Hall, Cambridge.

POULTON-LE-FYLDE.—November 7th.—For making up a street, for the urban district council.—Mr. J. B. Moss, surveyor.

NORFOLK.—November 7th.—For the supply of granite for the year ending December 31, 1915, for the county council.—Mr. T. H. B. Heslop, county surveyor, The Shirehouse, Norwich.

WEST SUSSEX.—November 7th.—For the supply or hire of steam rollers, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

WEST SUSSEX.—November 7th.—For the supply of about 200,000 gallons of tar, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

WEST SUSSEX.—November 7th.—For the supply of broken granite, quartzite, or other approved stone, chippings, tarred macadam, picked surface flints, pit flints, sand or binding material, cartage, and team labour, for the Roads and Bridges Committee.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

NEWMARKET.—November 12th.—For the supply of a steam roller with scarifier, for the urban district council.—Mr. William Henry Eley, engineer and surveyor.

HASTINGS.—November 14th.—For the supply of 1,000 yds. of unbroken blue stone, for the rural district council.—Mr. D. Paine, surveyor, Stonelynk Farm, Fairlight, Hastings.

EAST SUSSEX.—November 16th.—For the supply of materials, haulage, and team labour, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

Sanitary.

READING.—October 27th.—For laying sewer and constructing manholes, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

RUGELEY.—October 27th.—For the removal of refuse and nightsoil, for the urban district council.—Mr. W. L. Orgill, clerk.

TRURO.—October 27th.—For laying sewage and water pipes, for the rural district council.—Mr. C. Hancock, 12 Princes-street, Truro.

LEYTON.—October 27th.—For the construction of a circular concrete tank, effluent channel, and inlet culverts at the sewage disposal works, for the urban district council.—Mr. Ernest H. Essex, engineer.

AUCKLAND.—November 2nd.—For providing and laying down glazed earthenware pipe sewer and manholes, for the rural district council.—Mr. C. Heslop, sanitary surveyor.

RHYMNEY.—November 3rd.—For the construction of main outfall sewer, for the Sewerage Board.—Messrs. Willcox & Raikes, 63 Temple-road, Birmingham.

EALING.—November 3rd.—For the construction of a relief surface-water sewer and manholes, about 5,400 ft. of 24-in. armoured concrete tubes, for the corporation.—Mr. W. R. Hicks, borough engineer.

EPSOM.—November 3rd.—For the construction of concrete tube storm relief sewer and other works, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

EAST STOW.—November 4th.—For the construction of a sewer and manholes, for the rural district council. Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

BURNHAM (Somerset).—November 7th.—For the construction of sewers, manholes, ejectors, power station, and other contingent works, for the urban district council.—Mr. W. H. Chowins, engineer, Public Offices, Burnham.

ROCHFORD.—November 9th.—For constructing about 3½ miles of glazed-stoneware and cast-iron pipe sewers, together with manholes and other works, for the rural district council.—Mr. A. C. Madge, surveyor.

EASINGTON.—November 10th.—For the construction of about 16,000 lin. yds. of stoneware and cast-iron

[illegible] with [illegible] flushing chambers, and other works connected therewith, for the rural district council.—Mr. G. Waterhouse, engineer.

[illegible] LYNE. [illegible] 1914.—For the [illegible] of the sewage disposal works for the corporation.—Mr. J. Rowbottom, engineer, Town Hall.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—[illegible] Alexandria.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance
‡ Provisionally accepted

[illegible] for the urban district council.—Mr. J. Shaw, engineer and surveyor:—
[illegible] & Co., [illegible]

[illegible] and incidental works, for the urban district council.—Mr. H. Shaw, engineer and surveyor:—
[illegible] £130

PENSANCE.—The council have accepted the following tenders for [illegible] water and gas mains:
[illegible] & Hughes, £[illegible]
[illegible] W. Wynne £[illegible]
[illegible] W. Wynne £[illegible]
Gas Main.—£50.

PENSHAW.—For the work of road improvement, for the urban district council:—
Poppythorn-lane.—D. Turner (Ardwick), Limited, Manchester.
Gotch-lane Sewer.—B. Sharp & Sons, Leeles.

ROCHDALE.—Accepted for making good part of Cheltenham-street, for the corporation.—Mr. S. S. Platt, borough surveyor:—
J. Horrocks, Westhoughton.

SOUTH MIMMS.—For the erection of twelve workmen's cottages at South Mimms, for the rural district council.—Mr. G. Sharp, surveyor:—

J. J. Basson, St. Albans	£3,198
S. Worboys, Potters Bar	2,940
Willmott & Sons, Brentwood	2,880
Payne Brothers, Neavesden	2,793
Pilgrim & Sons, Wheathampstead	2,760
W. Extress, Bedley Wood	2,748
Williams & Sons, Potters Bar	2,640
W. Slough, Barnet	2,630
W. Simmons, Wood Green *	2,520

WALTHAMSTOW.—For the erection of boundary wall and iron fencing around the Billet-road site, for the Education Committee.—Mr. H. Prosser, architect:—

W. J. Mackenzie, Canning Town	£1,379
Webb & Co., Walthamstow	1,375
F. J. Coxhead, Leytonstone	1,333
A. G. Bastian, Walthamstow	1,317
J. S. Hammond, Sons, & Co., Romford	1,296
T. B. Lever & Son, Upper Holloway	1,295
J. Sands, Walthamstow	1,216
J. & J. Dean, Walthamstow *	998

WEST LANCASHIRE.—Accepted for sewerage extensions, for the rural district council.—Mr. J. Wignall, surveyor:—
J. Whittle, Ormskirk, Lancs. First scheme, £512; second scheme, £348.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

29.—Institution of Electrical Engineers. Sir John Snell, president, delivers his inaugural address. 8 p.m.
31.—Institution of Municipal Engineers: Eastern and North-Eastern District Meeting at Lincoln.

NOVEMBER.

2.—Royal Institute of British Architects: Ordinary General Meeting. 8 p.m.
9.—Surveyors' Institution: Mr. H. Chatfeild Clarke, president, delivers his opening address. 8 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE.

The West Riding Highways Committee invite applications for the post of Assistant Surveyor in the office of the West Riding Surveyor.

Applicants must have had good practical experience in road construction, particularly in respect of the use of tar-macadam, tar-grouting, foundation work, road widenings, &c. A sound knowledge of surveying and levelling is also necessary, and, in addition, applicants must be neat and accurate draughtsmen.

Salary, £150 per annum.

The successful candidate will be required to devote the whole of his time to the duties of the office.

Applications (on form to be obtained from the undersigned), accompanied by not more than three recent testimonials, to be delivered at the office of the West Riding Surveyor not later than 10 a.m. on Monday, the 2nd of November, 1914.

Canvassing will disqualify.

F. G. CARPENTER,
West Riding Surveyor.

County Hall,
Wakefield.
October, 1914. (2,017)

COUNTY BOROUGH OF DEWSBURY

SEWAGE DISPOSAL WORKS

WORKS MANAGER

The Sewage Disposal Committee of the Corporation invite applications from persons who have had large practical experience in the actual Construction of Sewage Disposal Works for the position of Manager of the Works to carry out by direct labour the Construction of Sewage Disposal Works at Mitchell Laithes, Dewsbury. Whole time must be given. Staff found by Corporation. Salary at the rate of £400 per annum. Applications, endorsed "Works Manager," stating age, qualifications, and experience in Sewage Disposal Works Construction, with copies of three recent testimonials, to be sent in to the undersigned on or before the 10th of November next.

No one who has not had large experience as Constructural Works Manager of Sewage Disposal Works need apply.

H. ELLIS,
Town Clerk.

Town Hall, Dewsbury.
October 10, 1914. (1,998)

RHYMNEY VALLEY SEWERAGE BOARD.

RHYMNEY VALLEY SEWERAGE CONTRACTS.

The Rhymney Valley Sewerage Board invite applications for the appointments of Inspectors in connection with the above Contracts, which comprise a Main Sewer, Storage Tanks (partly of Reinforced Concrete), Cast-iron Discharge Mains and Works on the foreshore of the Bristol Channel.

Salary from £2 10s. to £3 per week, according to qualifications.

Previous experience in the superintendence of work of a similar nature is essential, and full particulars of such experience, together with copies of recent testimonials, must be forwarded by the candidates with their applications, in envelopes endorsed "Rhymney Valley Sewerage, Inspectors," and addressed either to Messrs. Chatterton & Alford, 9 Victoria-street, Westminster; or to Messrs. Willcox & Raikes, MM.INST.C.E., 63 Temple-row, Birmingham, not later than October 31st, 1914.

T. J. THOMAS,
Clerk to the Board.

36 High-street,
Bargoed, Glam.
October 9, 1914. (1,996)

RURAL DISTRICT COUNCIL OF CHELMSFORD.

ASSISTANT ENGINEER AND SURVEYOR.

The Council require the services of an Assistant in the Office of their Engineer and Surveyor.. Applicants must have had previous experience in Engineering and Surveying, including Water Engineering, and be capable of preparing drawings, taking levels, and inspecting buildings in course of erection.

Salary (to include travelling expenses) commencing at £80 per annum, rising by annual increments of £10 (subject to satisfactory service) to £120 per annum.

Applications, stating age and previous experience, and accompanied by copies of three recent testimonials (which will not be returned), to be sent to the undersigned not later than the 3rd November, 1914.

(By order)
ARTHUR S. DUFFIELD,
Clerk.

96 High-street, Chelmsford. (2,022)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. OCTOBER 30, 1914. No. 1,189.

Minutes of Proceedings.

Irish County Surveyors and their Salaries.

We have already called attention to the inadequate remuneration of county surveyors in Ireland, and the obstinacy of county councils in insisting upon treating their officials with scant consideration. Reform in this matter is, it would seem, difficult of attainment, for it is only recently that the Waterford County Council have seen fit to place themselves in line with too many other authorities who pay their county surveyors salaries that are notoriously insufficient. Mr. W. E. L'Estrange Duffin, M.INST.C.E., the county surveyor, who has to his credit a long period of faithful and efficient service, resigned, and the Waterford County Council duly advertised for a successor. They proposed that the initial salary should be £350 a year, with a grant of £100 towards the purchase of a motor car. This grant is to cover all travelling expenses, and no increase of salary is to be allowed until after the lapse of a period of five years. These terms have been very properly criticised by the Local Government Board for Ireland as completely unsatisfactory. In a letter to the county council the board state: "The board are of opinion that the sum of £100 would not provide a good car, and that the cost of maintenance of it would be considerable, as the efficient performance of the duties of a county surveyor necessitates frequent travelling over the whole county. In the circumstances the board would suggest that the county council should again consider the terms of remuneration to be attached to the office, with a view of fixing a more liberal scale of salary, annual increments, and a larger allowance towards the cost and maintenance of a motor car and other travelling expenses." This rebuke was thoroughly well deserved, and it is to be trusted it will be received and acted upon in the proper spirit by the members of the Waterford County Council.

But we regret to confess we are not very confident of such an issue, especially if we are to judge by the parsimonious spirit evoked at a recent meeting of the Queen's County Council under conditions almost identical with those of the Waterford County Council. The county surveyor, Mr. John Rorke, had resigned, and the question of filling the vacancy, and the salary to be offered, came up for consideration. A proposal was made that the amount be £350 a year, and against this Mr. McEvoy protested. "You have already," he said, "lost one good man, and you are losing another now. Why not advance the salary and try to keep a good man if you can get him." And he proposed that the salary be increased by £100. In the subsequent discussion Mr. Maher distinguished himself as a shining light of economy by declaring that "he was sorry to see any person going for a rise. His idea would be to reduce the salary; £300 would be a good enough salary, even though the surveyors went away, and there ought to be plenty of good men to be got." The councillor's method of getting good men is, it will be noticed, a distinctly original one, and obviously he is not tormented by any fears as to how it will work in practice. However, it is sufficient to say that in the end the council fixed the salary at £350, and thus justified their reputation as false economists. Instances like these would almost make us despair if we did not feel that the repeated exposure of such scandals, backed up by official authority, ought eventually to have some effect upon county councils. If it does not, then there will be nothing for it but to deprive these bodies of the power of sweating their high officials, and insist that an adequate scale of salaries shall be fixed by the Local Government Board.

Practical Training of Engineers.

The report of the Special Committee on the Practical Training of Engineers has now been issued by the Institution of Civil Engineers, and it is somewhat to be regretted that this particular moment—when most men's minds are diverted into other channels—was chosen to make it public. The report is full of interest on the general question of the necessary education of the young engineer, but the portion of the report dealing with the training of the municipal engineer is naturally that which is of special interest to our readers. So long ago as March, 1913, the committee, consisting of Dr. Unwin, in the chair, and Sir Maurice Fitzmaurice, Mr. John A. Brodie, and Mr. S. S. Platt, considered this question, and it is very interesting to see that there was some considerable difference of opinion as to the merit or otherwise of a university course before becoming an engineer's pupil. The question of time and expense which is thus involved becomes a serious obstacle to such a course, and the difficulty of combining pupilage with attendance at evening technical classes is insuperable where there is no such training within reach, and is also a considerable tax on a young man's mental and physical strength. The question of municipalities objecting to their surveyor taking premium pupils was discussed, as was also the absurdity of some corporations expecting their surveyors to take pupils for a premium which was to be paid in to the borough or district funds. It was agreed on all sides that it would be of national benefit if properly qualified and able surveyors were allowed to take a reasonable number of premium pupils. As one of the committee remarked, "A pupil will not get much attention from the engineer if he does not get a premium," and this

[illegible], of course, a [illegible] fact. Why should he? The method adopted for training the pupil in an engineering office was also referred to, and substantially it came to this: (1) First to the drawing office to become a good draughtsman; (2) then practical experience out of doors with [illegible] and then [illegible]; (3) then on to any works under construction [illegible] roads, making, tramways, bridges, and so forth, acting as a sort of assistant clerk of works; (4) then back to the drawing office to design works, prepare specifications, bills of quantities, etc., and then on to the job to see it through from beginning to end; (5) in a large office he should then be transferred for mechanical work to the tramways department, the water department, refuse destructor department, and so on. As, of course, some pupils would not always be promising, a good suggestion was made that a pupil should be taken on probation, for, say, three months, and if approved then allowed to start his articles from the date of the beginning of his probation. These and many other subjects were most usefully discussed. The committee then came to the conclusions which we print on another page. We very heartily congratulate the institution and the committee on the result of their labours.

* * *

The Modern Municipal Engineer.

We have already noticed in these columns the appointment of Mr. E. R. Matthews, ASSOC.M.INST.C.E., as Chadwick Professor of Municipal Engineering in the University of London—an appointment which signalises the opening of entirely new opportunities of training for the younger members of the profession. Prof. Matthews has now taken up his duties at University College, and is inaugurating the work of the new department by the delivery of three public lectures—admission to which is gratuitous—dealing with important aspects of municipal engineering work. In our last issue we were enabled to reproduce for the benefit of our readers the initial portion of the first of these lectures, which deals with "The Functions of a Municipal Engineer." The remainder of this lecture will be found elsewhere in the present issue, and we are confident that the whole will be read with great interest and appreciation. At the outset Prof. Matthews pointed to the enormous amount of outstanding loans borrowed by local authorities for the execution of public works as demonstrating the growing importance of the profession of municipal engineering, and as justifying the new departure in university engineering education, of which he is the head. With a higher standard of training, however, the demand for adequate remuneration and security of tenure will become more insistent, and it is well constantly to bear in mind that these questions of efficiency and Government protection are in a large measure independent.

While fully recognising the almost infinite variety of the duties which may devolve upon the municipal engineer, Prof. Matthews instanced six principal matters with which his department is concerned—namely, water supply, sewerage and sewage disposal, road construction and maintenance, tramways, the collection and disposal of house refuse, and street lighting. Although some difference of opinion is bound to exist as to the relative importance of these and other services, we are inclined to agree with this list as being fairly representative of the work of an up-to-date municipal engineer's office, except that we should have included housing and town planning, or substituted it for street lighting, which is at present at a discount—at any rate in London! Of the specific topics dealt with in the lecture under notice, perhaps the discussion regarding assistance to the War Office is of the greatest current interest. One proposal, which we confess is new to us, although the Bridlington Corporation appears to have obtained powers as long ago as 1904, is that local authorities should, even in time of peace, purchase land for the purpose of allowing it to be used as a military or volunteer encampment or manœuvring ground. We are sure that Prof. Matthews' many friends will unite in wishing him every success in his new work.

* * *

Extraordinary Traffic: Who is Liable? II.

In our comments of last week on the question of the liability for extraordinary traffic we briefly referred to the decision in *Egham Rural District Council* v. *Gordon*, in which traffic conducted by a brick company in delivering bricks was held not to have been conducted "in consequence of" the order of the purchaser. It may be remembered that in that case Mr. Justice Darling regarded the words "in consequence of" as equivalent to "as a *necessary* consequence of." Fortunately, as it appears to us, this view was afterwards modified, and can no longer be regarded as correct. Five years after the Egham case the case of *Reigate Rural District* v. *Sutton District Water Company* (71 J.P., 405) came before the Divisional Court on appeal from a county court. In that case the company employed a contractor to supply materials for the construction of a reservoir. As in the Egham case, the mode of delivery was left entirely to the contractor, who made use of traction engines—although there was evidence that it would have been feasible to convey the materials in ordinary carts. As in the previous case, the County Court Judge held that the company were not liable; but the Divisional Court reversed his decision. Mr. Justice Darling revised his dictum in the earlier case, and said: "'In consequence of' means as a *natural* consequence of the order which was given; neither the inevitable consequence nor the necessary consequence of that order." And Mr. Justice Lawrence thought the onus was upon the company to show that the method of delivery adopted was not the natural method which they would have contemplated when they gave the order.

These views were approved by the Court of Appeal in *Bromley Rural District Council* v. *Croydon Corporation* (1908, 1 K.B., 353), in which the corporation were held liable for traffic conducted by two contractors whom they employed to deliver stone for road construction and repair—traction engines being used for the purpose. Lord Justice Kennedy, indeed, was inclined to extend the meaning of the term "consequence" still further, and to regard it as equivalent to "something which would not have happened but for the contract." This, however, was an *obiter dictum*, not necessary for the decision of the case, and it is perhaps open to doubt whether, in the event of a contractor resorting to an unusual method of carriage, or an unusual route, the employer would not escape liability. But it would appear that the Egham case can no longer be regarded as a precedent, and that, as a general rule, the employer of a contractor will, in the absence of exceptional and unforeseen circumstances, be liable for extraordinary traffic conducted by the latter.

* * *

Brodie on Boulevards.

We reproduce elsewhere a paper on "Wide Roads for Cities," which Mr. John A. Brodie, M.INST.C.E., the city engineer of Liverpool, read at a meeting of the Town Planning Institute last Friday. Mr. Brodie is an acknowledged expert in town planning matters, and it will be recollected that he was one of those whose advice was sought by the Government in the important question of the planning of the new City of Delhi. Therefore, as might have been expected, his paper was of a very high standard of excellence. Mr. Brodie claimed that wide roads were essential, not only for purposes of traffic, but also as air spaces,

playgrounds, beauty spots and places for healthy exercise. He pointed out that, up to the present, roads had not been made wide enough, and he instanced a case in Liverpool where a road had been twice widened and then had to be widened still further after only fifteen years had elapsed. This want of foresight had, of course, been very costly. Various points were taken up in the discussion that followed, some of them may be enumerated as follows. Has not a straight, wide road "a terrible sense of vacancy"? Should not the width of the carriageway be plotted to meet the exigencies of the traffic, and the total width of the road be discriminated from that of the actual carriageway? Was not the presence of tramways detrimental to the appearance of a wide road unless concealed by trees or shrubs? Were not the wide streets and roads in Germany mainly responsible for the very high house rents? Was it not a pity to use so many acres of land per mile per road when the ground could be otherwise more usefully employed? Was not the cleansing and maintenance of broad roads a heavy burden on the ratepayers? Are forecourts or set-backs not likely to be the reverse of picturesque unless kept in proper order? These and many other points undoubtedly beset the question of wide roads, and it is undeniable that considerable discrimination is necessary as to where such thoroughfares should be constructed. It is evident that the proper person to design a town planning scheme is the municipal surveyor or engineer, who alone understands and is prepared to meet just such difficulties as these.

* * *

Municipal Engineering in Canada.

In a recent issue of the *Contract Record* of Toronto there appears an article on "Recent Developments in the Field of Municipal Engineering," by Mr. F. W. W. Doane, the city engineer of Halifax, N.S., which affords a very interesting comparison as regards civic progress in Canada and the Mother Country. In the first place, the Canadian municipal engineer must be endowed with the same diversity of gifts as is demanded of his British cousin, for Mr. Doane recalls that it has been said that a city engineer should have the wisdom of Solomon, the patience of Job, the executive ability of Napoleon, the diplomacy of Talleyrand, and the temper of an angel—conditions which, he points out, have been implied in recent advertisements. As regards recent developments in Canadian practice, the main questions which have arisen for solution bear a striking resemblance to those which confront us at home. For example, strong and persistent efforts are being made to discover a cheap form of pavement or roadway construction which will enable the municipality of moderate means to maintain its roads in fair condition under the destructive influence of motor traffic. Purification in water supply, sewage disposal and sludge treatment, and improved methods of street cleaning are other matters to which special attention has been given of late in the Dominion. Town planning, too, is on the increase, and Mr. Doane places on record the fact that the city of Halifax obtained the first town planning legislation passed in Canada, having been protecting residential property and carrying on other similar improvements since 1896. It will thus be seen that the problems of the Mother Country are the problems of Canada—with this difference, however, that the latter, being a comparatively young country, can profit by the mistakes and experiences of the past.

* * *

Sewage Treatment at Sheffield.

The recently issued annual report of the city engineer of Sheffield, Mr. Charles F. Wike, is worthy of more than a mere passing allusion, especially with regard to the information and statistics dealing with the sewage disposal works which it contains. It is interesting to learn that very nearly 20,000,000 gallons of sewage per day has received treatment in tanks and contact beds, or on land. The total flow for the last three years has averaged 43 gallons per head per diem of the population—which is a large amount. The average amount of sludge produced at the works has been 7·73 tons per 1,000,000 gallons of sewage treated. About 62,000 tons of sludge had to be dealt with during the year covered by the report, and only 288 tons of this were taken by farmers, the remainder being apparently tipped on about 32 acres of land specially reserved for the purpose. Mr. Wike calls attention to the large increase of trade wastes in the sewage, and especially to the presence of petrol, which, as he points out, is "not only objectionable from a purification point of view, but obviously may prove highly dangerous if the vapour emitted should become confined in the sewers at any point."

The methods adopted for the purification of the sewage appear to be working very satisfactorily, as the numerous diagrams and tables clearly indicate, and it is of special interest to observe that Mr. Wike notes in one part of his report that—"The effluents obtained have been exceedingly good for primary beds, and any secondary treatment needed will only be such as to remove the colloidal and suspended matters which at times remain." This might be expected, as these colloidal and suspended matters in sewage effluents are often a great source of trouble to all sewage works managers. There is another matter in connection with this report that is worthy of notice, and that is the amount of purification effected by tank and land treatment of a portion of the sewage, which shows an amount of purification almost equal to that effected by tank and double contact treatment. Mr. Wike's report is a valuable addition to the existing literature on sewage disposal.

* * *

A Possible Danger.

The heavy siege guns of the German Army, which were used with such deadly effect before Antwerp, are limited in their uses owing to the fact that they must be set upon substantial concrete foundations. There is a considerable body of evidence to show that, as regards the battlefields of France and Belgium, these necessary concrete beds had been prepared in time of peace under the guise of foundations for hotels and chateaux; and the question is being widely asked whether the emissaries of the enemy may not have been engaged in similar work in this country. The matter is one which common prudence demands should be investigated rigorously and systematically, and it would appear that very valuable assistance can be rendered to the military or police authorities by the records of building plans and building inspection which should be in the archives of the London County Council and the district surveyors in the Metropolis, and the local authorities responsible for building inspection in other places. A few days ago a sensational story was spread that a concrete roof, between 3 ft. and 4 ft. thick, had been discovered on a building at Willesden which was in the occupation of a German firm, and situated so as to command several important lines of railway. It subsequently transpired, however, that the alleged thickness of the roof had been grossly exaggerated, and that the principal importance of the "discovery" lay merely in its proof of the fact that the authorities are alive to the possibilities of danger. In matters of this kind anything in the nature of panic is both useless and foolish. The work of investigation must be steadily pursued, without hesitation and without fluster, and we feel sure that in its prosecution any assistance which municipal engineers can render will be readily forthcoming.

Some Notes on the Development of Wide Roads for Cities.*

By JOHN ALEXANDER BRODIE, M.INST.C.E., M.I.MECH.E., M.ENG.(LIVERPOOL), City Engineer of Liverpool.

The question of town planning which deals with the question of wide roads has received a great deal of attention and has been very widely discussed during recent years, but there is still room for differences of opinion both on matters of principle and of detail.

We are all, I think, however, agreed in a general way that some wide roads are an advantage, and are, in fact, required in connection with even the smaller populations, and that they are still more necessary in the larger cities; but when we come to settling the width of any particular road we find that great differences of opinion arise, and that there is a general tendency on the part of a large number to continue in the good old English way and to muddle through on the lines of cheap first cost, without looking ahead and without making satisfactory provision for the probable future requirements—leaving, in fact, the future to take care of itself.

As one who has for a period of thirty years studied and been connected with the design, construction and maintenance of roads, tramways and means of communication generally in large towns, it has been my lot to spend very large sums of money in road improvements, most of which expenditure could easily have been avoided by foresight if combined with better powers of control over the laying out of new areas. Liverpool has spent on works of this description over £5,000,000 during the last fifty years, which works out at an average of about £100,000 per annum; and to-day, notwithstanding our enormously increased added areas, this average is hardly being maintained.

Many of the other great cities have also spent immense sums in such improvements; but, notwithstanding this, it can truly be said that no city in this country is well provided in regard to arterial roads.

LONDON.

The great City of London is in this respect without doubt the greatest sinner in this country, and I am not aware that there is as yet a single great trunk road worthy of the name through the built-up area by which we can leave for any part of the country.

Considerable attention has recently been given to this important matter, and it is to be hoped that any works of this description which are put in hand will be carried out on a sufficiently generous scale to meet the future needs of the great Metropolis. It is very important that the largest possible view should be taken when dealing with arterial roads leading out of London. Present conditions are not, however, very favourable for heroic schemes, and it is a little difficult to see where the funds are to come from. In my opinion, £500,000 to £1,000,000 per annum could be usefully and economically expended on this work for many years in the London district alone.

As some of my friends state that I am desirous of having all roads very wide, I think it well to say that my ideal is rather suitably to apportion the width to meet the probable requirements, and that, just as in a system of watercourses we must have the smaller streams and brooks as well as the larger rivers, we must in all systems of streets bear in mind the requirements and conditions which have to be met. If a sufficient number of wide roads are provided to meet the requirements of through communication, a much freer hand can be given in regard to those subsidiary roads where width at any rate of road surface is not of real importance.

While the spending of public money on wide road improvements is always open to criticism, we have probably reached the point where public authorities, as apart from the individual, are satisfied that money spent in advance judiciously has been warranted by results, and we find it no longer so difficult to get the necessary money for important schemes of road widening and improvement.

Cross-section of 60-ft. Road (Edge-lane Drive, Liverpool) Widened to 120 ft.
(Tramway tracks laid in grass.)

In some cases we are even being offered more in the way of widened roads than can reasonably be considered necessary for the requirements of the district concerned. In one case, after arranging for one through road 84 ft. wide, we were approached to see whether we would contribute towards the cost of constructing two roads parallel to the original one, and immediately adjoining, each 60 ft. wide. Though no contribution could be made, the developer decided that he would still make the road 60 ft. wide at his own expense, though the property was only of the cottage type, with a rental of less than 9s. per week, and he has seen no reason to regret his decision. These roads are being quickly developed and built to, whereas other streets at no great distance away, laid out as by-law streets to 36 ft., are being built to at a much slower rate.

Generally speaking, our experience of the construction of wide roads is that it leads to the building of a larger number of better-class houses, and this, again, reacts in the direction of the general improvement of the neighbourhood.

PLEASURE WALKS.

In dealing with wide roads it is very necessary to consider the various purposes which roads are intended to serve, and it will, I think, be found generally that we are too much inclined to consider roads

* Paper read at a meeting of the Town Planning Institute held in London on Friday last.

[illegible] some one particular point of view, such as health as against the financial aspect of the subject, which, after all, must be the position taken up by the authorities whose duty it is intended to start the ball rolling.

The question of convenience and utilisation as a recreation or exercise ground by the population living on either side of the road is, I venture to think, one important [illegible] which is apt to be overlooked by those responsible for the purse-strings when expenditures on wide arteries are under consideration.

This side of the question is one which is, I think, [illegible] faced and developed if we are to rear children and young people healthily in, at any rate, those cities where the average rate of income is low, while opportunities for walking exercise on the part of the grown-ups under conditions which will interest them is of almost equal importance.

[illegible] well as from the country districts; and I venture to think that one of the outcomes of our present troubles will be that greater attention will be paid, especially in towns, to all matters which are likely to lead forward in the direction of assisting people to make and keep themselves fit and vigorous.

Prince's-avenue, Liverpool. 124 ft. Wide.

I have in my mind a road constructed thirty-five years ago to a width of 126 ft. between fences and 190 ft. between the fronts of houses, and having a length of over ½ mile, which is used to an enormous extent as a public walk at all times of the day, but especially in the evenings and on Sundays and holidays; while the central walk, which is lined with trees on each side and provided with seats, is more used in proportion to its area by the children of the neighbourhood than the public parks to which it forms the main approach, though the latter have greater attractions in the matter of ornamental ponds with wildfowl, pleasure gardens with flowers and beautiful trees, which, being at a greater average distance from their homes, cannot be so conveniently reached.

After careful observation, I know of no expenditure of public money in Liverpool which has, on the whole, given greater pleasure and has been more profitably enjoyed, and in my view every important residential district should have such a "lung," and particularly those in which the tendency to overcrowd is greatest. Its use for these purposes in no way interferes with or reduces its effectiveness as a section of a main arterial road leading radially out from the centre to the outlying districts beyond, and a word or two as to the general tendency of traffic on it may be of interest.

This road is laid out with a central boulevard or gravel walk 50 ft. wide, having on one side of it a stone sett-paved street with a double line of tramways, and on the other a pitch-macadam carriageway, together with the usual footwalks. The traffic on both roads, though fairly light in character, is considerable, amounting to over 150,000 tons per yard in width per annum on each carriageway, or a total tonnage of 2,700,000 per annum, exclusive of tramway vehicles, and appears to be about equally divided between the sett paved and macadam road.

Motor traffic is now very considerable, and shows a tendency to prefer in each case the side of the road nearest the central walk, which is only broken by one vehicular crossing near the centre of its length, and it is quite noticeable that experienced motorists avoid the outer sides of the roadways which are intersected by entrances from the side streets, though these outsides would be the natural line for this traffic if the whole road was taken as one carriageway.

Though Liverpool has for many years had the experience and the good example of the wide road already referred to, and many other older streets of good average width, it had before the days of electric tramways settled down to a sort of standard width of about 60 ft. for its main approaches, both within its own area and in the adjoining districts which were still under the control of small local authorities. On the introduction of the faster travel by electric tramways, necessity arose for wider streets, and 60 ft. became the minimum standard. Since that time widths have continued to be increased, the 60 ft. has been increased to 80 ft. as a minimum standard through built-up areas, while 100 ft., and more recently 120 ft., may now be taken as the standard for the most important arteries when passing through areas not closely built upon.

A PROPHECY.

I venture to think that before long 120 ft. will be considered a minimum for a very limited number of the main arterial roads leading into great cities wherever such roads can be provided at a reasonable cost when compared with the cost of alternative methods of providing fast services on special lines, my view being that money spent on wide roads is a real advantage to the congested communities living in their neighbourhood.

As evidence of the desire for wider roads, as the results of actual experience I may say that I am at the present time negotiating for the widening to 120 ft. of one road which has already been widened to 60 ft. A portion of Queen's Drive, also constructed to 84 ft., is now being widened to 120 ft., and I have also negotiated for and completed the purchase of all land necessary for widening a radial road to 120 ft. for a length of over 2 miles, a portion of which is for the present entirely outside the city area.

A considerable length of this latter 120 ft. wide road has already been completed, the tramway lines being laid in grass in the middle of the road, and the track fenced off from the other traffic by low privet hedges. A speed of 20 miles per hour has been approved by the Board of Trade for the tramways which are now running, and this speed will no doubt

[illegible]

[illegible]

[illegible] the electric train service, which gives a speed exceeding 20 miles per hour on the average.

I therefore look forward to an improved and [illegible] have width of roadway, without which, in my opinion, [illegible] will be arranged and carried out largely on utilitarian lines much in advance of anything in the way of building and architectural development, though I certainly agree that in the central areas of large cities the architect should be given as free a hand as is possible, but even in such positions utility must carry as much weight as appearance.

OPEN SPACES

One very important point which should carefully be borne in mind by town planners is that really wide roads can be made to help considerably in the operation of the number of houses to the gross acre, and this particularly when dealing with areas where the houses are of a small type in which in many parts of the large cities it is exceedingly difficult to keep open spaces such as gardens, &c., in tidy condition, and where it is found as a matter of practice that it is better to maintain much of the open areas at the expense of the rates. This has been our experience in Liverpool in the poorer districts, and in addition to wider roads, many areas of an acre and upwards have recently been laid out and maintained at the cost of the public, these in many cases containing playgrounds for children fitted up with

Menlove-avenue, Liverpool. 114 ft. Wide.

[illegible] high speeds [illegible] be attained.

The roads which are of most importance are, of course, the radial roads, but these have a tendency to drive traffic through the central areas which are most congested, and as much traffic can be diverted by means of cross roads, or in the outskirts ring roads, we have also found it necessary to provide through routes for this class of traffic, which, in the case of Liverpool, enables traffic coming in by way of the main roads from Lancashire to distribute itself clear of the congested central area, and our ring road has already been found very valuable from this point of view.

A considerable motor traffic is also arising between the desirable residential areas which lie mostly to the south of the centre and the northern portion of the docks which lie in the neighbourhood of Bootle.

Motorists are quick to recognise that a wide road, even if apparently roundabout, saves much time as compared with narrow roads, especially if congested with traffic.

Another important point is that of appearance, and as I do not pose as one having a trained eye to beauty I propose to leave that section of the subject to those who are better qualified, especially as architectural friends appear to think that no engineer should presume to have ideas on such an essential of beauty as proportion in design.

I venture to think, however, that, whether it is right or not, and whether we like it or not, most of the great arteries on the outskirts of larger cities will be dealt with by engineers, and that, on the whole, arrangements for the playing of the usual children's games.

I think it is well worth consideration on the part of those responsible for the designs of wide roads, and especially those intended as cross town routes or ring roads, that they should as far as possible connect up open-air spaces, and in Liverpool on our ring roads we are attempting to acquire and retain several spaces and tree-planted areas, which are intended to be in the nature of embayments off the road, and which will no doubt be dealt with ultimately as beauty and recreation areas likely to add additional interest, and thus give pleasure to those who use these roads for purposes other than that of through traffic.

With regard to the design of main arterial roads, I much prefer those arrangements of surface in which the speedy lines of traffic are kept as near the centre of the road as possible, leaving the slower traffic to follow the line near the footways. In this way the noise and inconvenience caused by fast traffic is removed as far as possible from the foot passengers and the houses, while the fast traffic is itself freed from the continual necessity of closely watching the traffic coming in from side streets, and can safely adopt a higher average speed than when running close to the footwalks.

The meeting of the Town Planning Institute at which Mr. Brodie's paper was read was held at the offices of the Institution of Municipal and County Engineers, 92 Victoria-street, S.W. The chair was

occupied by Mr. Ra[illegible] Lawin, and there were present Sir George Gibb, chairman of the Road Board, [illegible] G. S[illegible] R[illegible] B[illegible] Prof. S. D. Adshead, Messrs. Patrick Abercrombie, H. V. Lanchester, C. J. Jenkin, engineer to the Finchley Urban District Council, E. G. Allen, Henry E. Stilgoe, city engineer and surveyor of Birmingham, A. S. Soutar, G. Marsh, J. W. Cockrill, borough engineer and surveyor of Great Y[illegible], H. Percy Boulnois (Westminster), Edmund R. Abbott, clerk to the Ruislip-Northwood Urban District Council, Thomas A. Mawson, Henry R. Aldridge, Rees Jeffreys, secretary to the Road Board, Edward Willis, [illegible] and surveyor to the Chiswick Urban District Council, and G. L. Pepler, hon. secretary to the Town Planning Institute.

DISCUSSION OF MR. BRODIE'S PAPER.

Mr. H. E. Stilgoe, city engineer of Birmingham, proposing a vote of thanks to Mr. Brodie for his paper, remarked that the latter had shown most clearly how economical it was to provide for the laying out of wide streets in the first instance. He had shown how streets which had been widened to 60 ft. in recent years had subsequently to be widened to something greater—120 ft. had been quoted. The exercise of a little foresight would have avoided that extra expenditure. But while considering the width of the street, they must see that the buildings were kept set back as far as possible, because if at some future time it was again necessary to widen, the purchase of forecourts was comparatively easy. Mr. Brodie did not advocate making up the street to its full width at once; his idea was to make the carriageway just as wide as was necessary and plant trees and make footways. The final width over the area pegged out could be carried out as time and traffic requirements showed it to be desirable. Mr. Brodie had showed how these streets might be used as elongated parks. He was in agreement with him. He was opposed to the idea of city flower gardens, being more in favour of the provision of playing-fields, which could be acquired in the suburbs of most towns at a cost of from £120 to £200 per acre. There were many other ways in which the wide street proved economical. Water, telephone and other services could be laid in the footpaths, and prevented the streets being eternally cut up with cross trenches. Then there was the economy in tramway construction. A matter of £3,000 was saved per mile in double-tracked sleeper construction; greater speed was possible, there was less noise in running, and a lower maintenance cost. In Birmingham the cost of repairing tramways was £300 per mile of single track, and almost the whole of that could be saved. Finally, the judicious laying out of arterial highways permitted of the ordinary estate streets being laid out of less width and of more moderate construction.

Sir George Gibb, chairman of the Road Board, said he agreed with Mr. Brodie that every effort should be made to prevent bricks and mortar covering every inch of unbuilt-on land at the outskirts of towns. He was also with him in wishing for wide streets, but he did not know that he followed him exactly in the great widths that he advocated. One must take account of the varied aspects of the question, and the decision must be based on the consideration of all these points of view. Personally, he confessed that he did not like straight roads—æsthetically, he meant. The idea of taking a map and putting straight lines upon it was a great mistake to his thinking. He was in agreement with Mr. Brodie as to securing as much land as possible, but it was a question well worthy of discussion whether, instead of providing strips of ground along the roads for recreation and other purposes not strictly connected with traffic, it was not better to have the land in the form of playing-fields. He was inclined to favour the latter course. Then as to traffic and width of roads. It was no use talking about the widths of roads in the abstract. It was a question that had to be decided according to the circumstances in each case. It was unwise not to have foresight, and equally unwise to have too much foresight; but he doubted the traffic value of any road much over 80 ft. in width. He was, of course, excluding all considerations except that of traffic. For traffic purposes he thought he preferred the duplication of the road to excessive width. Very wide roads were dangerous to the pedestrian, and the regulation of the traffic became necessary. People spoke of arterial roads without any proper appreciation of what they meant. Each locality had its own interests and its own views. People spoke about the need for co-ordination, but if each local authority were encouraged to prepare its own town planning scheme he did not think much difficulty would be experienced in constructing out of the various schemes a road which, if not an absolutely straight line, would at any rate be a good, satisfactory arterial road in the end.

Mr. H. Percy Boulnois (Westminster) said he agreed with a great deal of what Mr. Brodie had said regarding wide roads. After all, the actual carriageway was a question of traffic, which was of the greatest importance; they must design the actual carriageway to meet the requirements of the traffic. As to the width between houses, some people favoured forecourts or gardens. Personally he thought these—particularly those in small property—were neglected and were no good whatever. He considered that a double set of carriageways with a green strip in the middle, and wide footways, was the right class of road for nearly every sort of town. On the matter of tramways he supported Mr. Brodie in his view that these should be in the centre of the road, and, if possible, screened by hedges; but he considered that as a means of transit tramways could now compete with the motor omnibus. That was well established. The fact was that the tramway was a light railway, and should be used as such. There was the danger that these lines would take the people away from the towns to districts where they would be exempt from the payment of rates for the privileges they were getting; but their usefulness could not be denied. They were a necessity in all arterial road schemes, and, if properly designed, would not be a disfigurement. This was exemplified by the line laid down at Southend-on-Sea. Mr. Brodie had not advocated the laying out of broad roads solely for utility purposes, but as excellent promenades for those desiring fresh air and exercise. London lacked anything of that kind, much to his regret. The little corner plots which Mr. Brodie had advocated was another good idea. There was one point in connection with the provision of the proposed boulevards, and that was that they would be made use of by heavy traffic. That, however, could not be prevented. Another important matter was the cost of maintenance of these wide roads—maintenance, lighting, scavenging, and so forth—while it was proverbial that such thoroughfares were bad for shopping. So there must be some judgment exercised in the provision of these wide streets. He congratulated the author of the paper. Mr. Brodie was an enthusiast, but, unlike most enthusiasts, he was a level-headed man, and what he said to-day on the question of town planning the world would think about to-morrow.

Mr. E. R. Abbott, clerk to the Ruislip-Northwood Urban District Council, stated that the town planning scheme of his authority provided, in the first place, for 80-ft. roads. The landowners, however, fought rather shy of the idea, and it was ultimately agreed to come down to a width of 60 ft. But even with that reduced width they found that the owners were not willing to bear the extra cost of construction, and further concessions had to be made in their interests.

Mr. C. J. Jenkin, engineer and surveyor to the Finchley Urban District Council, put forward a plea for the unification of treatment of roads through the whole area of London. He considered that, both from the point of view of economy and safety, it was desirable to put tramways in the centre of the road. As to open spaces, it was not advisable for small children in the poorer districts to go far from their homes; it seemed, therefore, far better to have grass margins in the streets of such localities.

Captain G. Swinton (Road Board) expressed the belief that if they were laying out towns again in this country, the way to do it would be on the system of radial parks. By running their roads out through parks getting wider and wider as they proceeded, they arrived at the solution of the problem.

Mr. Henry R. Aldridge remarked that the great thing was to have the necessary distance between the houses.

Prof. Adshead took objection, on æsthetic grounds, to the placing of tramways in the centre of a street.

Mr. J. S. Birkett suggested that very wide roads would be likely to increase the cost of living, because he understood that in Germany the building land on each side of the very wide thoroughfares in that country had risen enormously in value.

Mr. Thomas A. Mawson remarked that a 120-ft. road suggested a terrible sense of vacancy. All streets, whether wide or narrow, might be considerably im-

[illegible] a little more practice were paid to the [illegible] planting trees along them.

Mr. Barnes, in replying, said the street was, to his mind, one of very great importance at the present time. There was room for differences of opinion. Sir George Gibb disagreed with him on the question of [illegible] a chance of getting plenty of money from the central authorities to carry out wide roads in the way that they should be carried out, he might be prepared to [illegible] street improvements in Liverpool, but when he told [illegible] time were getting from the tramways undertaking towards the relief of the rates up to £100,000 a year, they would see that in doing the best he could for the tramways he was also doing the best he could for road improvements. It did not matter at all whether the £100,000 was earmarked for street improvements or not when looked at from the large point of view. He was bound to help to improve the tramways income, otherwise the profits from the tramways might disappear. If the traffic was going to be carried by the Lancashire and Yorkshire on their electric line, by the Overhead Railway, or carried through the tunnel under the Mersey to Cheshire, the source of income from the tramways disappeared altogether. He believed that tramways properly designed and carried out would ultimately beat the motor 'bus; but, as he had pointed [illegible] meeting at Newcastle recently, tramways had got to be speeded up, and at the same time improved, in order to do away with such nuisances as noise. On this latter subject he mentioned that two or three tramway people were looking into his suggestion to use rubber tyres for tramcar wheels. To prevent children straying on to the tracks low privet fencing had been put down on each side of the tramways. There was not the same difficulty in crossing the wide roadway in Liverpool as there was in crossing the Embankment. A width of about 30 ft. was left in the middle of the road, and there were two 24-ft. carriageways, and the two lines of traffic could be separately negotiated quite safely. He had deliberately made the crossing and stopping places not nearer together than about 300 or 400 yds., because if high average speed were required there must not be too many stops. He insisted upon making a road safe, and the way to do that was to make it wide enough and divided up so that traffic was properly dealt with. Captain Swinton's idea of radial parks was a very good one, but he did not think there was anything of special value in making the parks wider as they extended outwards. Really wide roads would do, but those he was proposing at present were not "really wide." He did not think that we as a nation were entitled to consider that we had put down wide roads considering that other countries had some 350 and 400 ft. roads with parklike or playing areas between the carriageways. Sir George Gibb had suggested duplicate roads, but it would be found very difficult to get even a very limited number of wide roads, especially through built-up areas. As to the question of playgrounds, to which Mr. Boulnois had referred, he did not think they could find space for these in a 120-ft. [illegible]

Supply of General Stores.—In a report submitted [illegible] Council, the Stores and Contracts Committee of that body state that the curent contracts for the supply of general stores will, with a few exceptions, expire on December 31, 1914, and that they are taking steps with a view to obtaining supplies during the year 1915. This group of contracts, which ordinarily comprises upwards of forty schedules, is the largest of the several groups dealt with each year, and generally includes all such goods as metals and metal goods, electric cables, lamps, fittings and materials, petrol, oilman's sundries, glass, horticultural goods, rubber goods, chaff and fodder, soap, leather, baskets, mats, &c. &c. Owing to the special circumstances which have arisen in consequence of the war, it is proposed in some cases to purchase goods during 1915 at the current market rates or under special quotations until trade conditions again become normal, or until it is considered that the time is favourable for new contracts to be entered into. In all other cases, however, new forms of tender and schedules have been prepared, and will be issued shortly.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Would it not be a popular and patriotic movement on the part of our Members of Parliament if they would, each and all, contribute their £400 a year to the funds for providing field ambulances? And would not our wounded soldiers bless them for having aided in supplying them with this very necessary adjunct to the battlefield?

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Has [illegible] of the Institution of Municipal and County Engineers acted very wisely in deciding not to hold the proposed "National Road Congress" next year, or to co-operate with the County Councils' Association in this proposal? Was it not evident from the first, irrespective of the question of war, that the proposal to hold such a joint conference might have resulted in various complications?

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Is there not a good deal to be said in favour of systematic "air blowing" into sewage in order to keep down the smell? Shall we not all look forward to some further reports from Dr. Fowler and Mr. Watson as a result of the experiments they are carrying out at Manchester and Birmingham respectively on this important point? Are there not still a large number of sewage disposal works in this country where very objectionable smells are frequent?

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When will the Engineering Standards Committee be ready with their long-looked-for "Standard Specification for Road Stones"? Are we not all looking forward to its issue with considerable interest?

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Are not the Chadwick Free Public Lectures which are to be given during November and December, of just the right description at this time? Are not such subjects as camp, ship and hospital hygiene, military sanitation in the Tropics, war and disease just the very matters on which scientists and the general public require information and instruction at this moment of stress and danger to our noble fellow countrymen in the field?

* * * *

Is it true that the expert committee formed by the Roads Improvement Committee to investigate the claims of the 700 horseshoes which were submitted in competition for the 100-guinea prize have, after protracted investigation, been unable to find so perfect a shoe as will warrant their recommending that this prize should be given? Is it not also rumoured that the committee are proposing to recommend that three prizes of 20 guineas each be awarded for the best type of shoe in which a rubber strip pad is fixed in the heel, or grooved, with tarred gaskin or rope firmly fixed in the groove? Shall we not await with interest the publication of the awards and the reasons for the selections made?

Cement Waterproofing. The architects for the Yarm Territorial Headquarters, Middlesbrough, report that they have used the cement waterproofing powder Pudlo in the basement of this building, and that the result has been extremely good.

Society of Engineers.—On Monday next, at a meeting of this body to be held at the Institution of Electrical Engineers, Victoria Embankment, W.C., Mr. James Tonge, M.I.MECH.E., F.G.S., will read a paper dealing with the uses of the hydraulic mining cartridge. The chair will be taken at 7.30 p.m.

The Local Candidate in America.—The modern tendency among men who are trying to promote efficiency in the public service is to get the best man for the job—at home, if possible, otherwise abroad. And in every city where the new idea has taken hold there is the same shout to "keep the jobs at home." It all depends upon the point of view. If the municipality is more interested in providing jobs for its home people than in developing efficient government, of course the proposition to hire out-of-town experts is wholly unjustifiable. But if efficient and satisfactory service is to be taken as the chief end of municipal government, it is quite obvious that when the right kind of a man is not available at home, he should be looked for wherever he is to be found. *(Cincinnati Times-Star.)*

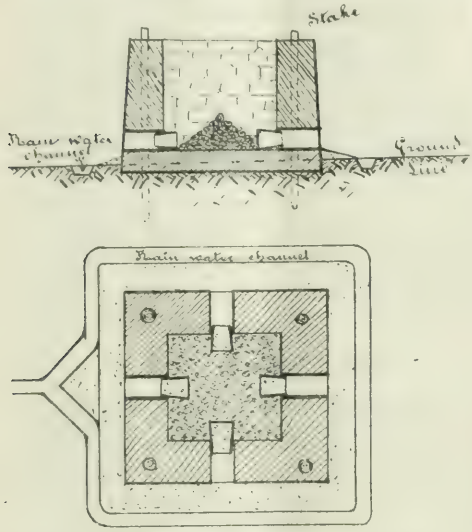
Camp Sanitation.

(2.)—REFUSE DISPOSAL.

By G. BERTRAM HARTREE, F.S.I., Engineer and Surveyor to the Alton, Hants, Urban District Council.

The disposal of refuse was a matter that received attention in the earliest camps recorded in history. A very old work relating to an expedition that left Egypt for Judæa states that stones were fixed at a considerable distance beyond the camp, and inscribed: "All rubbish to be deposited beyond here." Evidently these people were well grounded as to the necessity for removing refuse to prevent nuisances from smells, but apparently, having got rid of it a distance from the camp, they made no arrangements for destruction. While the removal prevents the olfactory nuisance, the accumulation, wherever it may be, must lead to another equally objectionable.

The deposit of eggs by flies, and the maggots that follow, are an acknowledged source of danger to the community, and in treating with camps, as with



Built-up Incinerator.

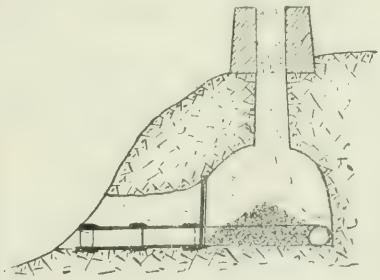
dwellings, arrangements should, where possible, be made for refuse destruction. All camp refuse should be removed daily, and whenever possible burned; otherwise it should be buried. Possibly for temporary camps the last-mentioned precaution is sufficient. For more permanent camps some form of destruction is desirable. Camp incinerators are made from any materials at hand; bricks or large stones are, of course, very suitable, but in their absence turf or similar substance may be used. Where neither material can be obtained sheets of galvanised iron may be adapted.

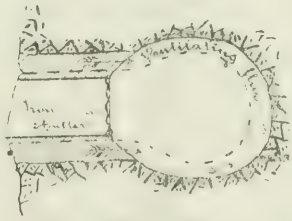
The erection of the familiar type of destructor with a towering chimney shaft is impossible, but exceedingly useful incinerators may be constructed with any of the foregoing materials, and square or circular in shape, as circumstances warrant. When galvanised iron is used the circular shape is preferable, and a base support of earth and sods is imperative; the iron is bent to shape and the ends secured by wire. Three sheets are the most effective number to use. Should turf be the local material, my preference is for the square shape, as four suitable stakes driven from the top through to the base and into the ground form excellent stiffeners at the angles.

A useful type of incinerator measures 3 ft. to 4 ft. internally, and is 3 ft. to 4 ft. in height; no flue other than the full opening is provided, but an effective draught at base is necessary. The holes for this purpose (which should not be less than four in number) may be arched over in brick or stone, or 9-in. drain pipes provided; although orthodox construction requires the popular bully beef tins with their bottoms knocked out and socketed together to make the requisite length that will allow a projection inside of at least 6 in. Whatever material is adopted for draught flues, tins are very suitable for the inside terminals, as, by leaving the bottom unbroken, perforations may be made at suitable points to lead the draught in the desired direction. A heap of stones, either conical or pyramidical in shape, and not less than 15 in. in height, is desirable on the floor to assist the draught and to retain the heat. After the consumed material is removed, damp or wet refuse may be placed on these stones to assist its partial drying. A temporary roof is desirable during this operation. I have seen a useful form of incinerator made by excavating a small cavern in the side of a hillock, sinking a flue from the top, and filling up the entrance, but leaving space for draught flues. In this type the draught or ventilating flue is more effective if carried around, as shown in sketch, and is further improved by the use of tins with suitable perforations, and a free current of air can be obtained at any point.

As with the town destructor, an auxiliary fuel is generally required for firing up; paraffin oil and dry paper, or other fuel, should suffice for the purpose, and by careful attention the fire should burn day and night.

In order to keep a camp in a sanitary condition it is imperative that solid or liquid refuse should be prevented from remaining on the surface of the





Excavated Incinerator.

ground; this course is equally necessary for waste from kitchens as with fæcal matter. Solid matter should be constantly removed and destroyed in incinerators, while liquids may be disposed on grease soakage pits. These should be provided in pairs near the kitchens, one to arrest the grease, the other to receive the clear liquor. To prevent the grease stopping the earth pores and forming scum to attract flies, the primary pit is filled with dry, absorbent material.

Paper, straw, heather, or brushwood are suitable filtering media, and should be removed as soon as fouled and burned in the kitchen fires. On land of heavy character a filter would be advantageous; this could be made from an empty barrel or box with perforations in the bottom. The filtering media may consist of layers of charcoal covered by stout paper,

[illegible] rubble drain leading to a soak pit. This form of [illegible] must be burned.

Quicklime is invaluable in camp sanitation, and with a suitable local stone the provision of a lime-kiln is of advantage. Either the intermittent or constant feed type could easily be constructed with selected blocks of limestone set in clay and plastered outside with the same material; or, under favourable conditions, an excavation may be made in a hillside in a manner similar to that illustrated for refuse destructors.

2nd (RESERVE) LONDON SANITARY COMPANY.

Captain Arthur J. Martin, R.A.M.C., T.F., writes as follows from the Duke of York's Headquarters, Chelsea, S.W., under date of Wednesday last:

"Your readers will be glad to hear that, thanks to the publicity which you so kindly gave to my recent appeal for recruits, and the good offices of the various professional societies, the ranks of this company are now filled.

"As will be seen by the enclosed lists, a large proportion of the members of the company and of the Imperial Service Company are in civil life officers of the various local authorities. We have besides many engineers, architects, chemists and others whose civil occupations eminently fit them for the duties which they will have to perform.

"As an engineer, I am proud of the way in which the members of my own and allied professions have come forward—in many cases giving up good positions—and placed their ability and experience at their country's service.

"I am still receiving daily many applications from well-qualified men in all parts of the country. I am placing their names on a waiting list with a view to filling casual vacancies. They will also, of course, be available in the event of the War Office deciding to form any additional Sanitary Companies."

2nd (Imperial Service) London Sanitary Company.

Major C. E. Goddard, medical officer of health, Wembley Urban District Council (O.C.); Captains C. M. Fegen, medical officer of health, Croydon Rural District Council, and P. N. Cave, assistant medical officer of health, Croydon Rural District Council; Lieutenant W. J. Slowan, education department, London County Council; staff-sergeant H. E. Brown, sanitary inspector, Wandsworth Borough Council; sergeants H. A. Palmer, sanitary inspector, Wandsworth Borough Council, and S. D. Lewis, public health clerk, Wembley Urban District Council; lance-sergeant T. H. Robey, public health clerk, Fulham Borough Council; corporal W. Edwards, mortuary keeper, Wandsworth Borough Council; lance-corporals F. H. Manning, sanitary inspector, Fulham Borough Council; E. J. Pitts, public health clerk, Bermondsey Borough Council, and A. H. Blake, disinfector, Wandsworth Borough Council; privates M. Caxton, sanitary inspector, Fulham Borough Council; W. H. Brown, disinfector, Wandsworth Borough Council; C. M. Meir, public health clerk, Bermondsey Borough Council; R. Langmaid, public health clerk, London County Council; N. J. Osborne, sanitary inspector, Bushey Urban District Council; E. Partridge, public health clerk, Wimbledon Urban District Council; F. J. Kendall, public health clerk, East Ham Urban District Council; H. Hilliman, public health clerk, Wandsworth Borough Council; W. J. Eversett, sanitary inspector, Congleton Urban District Council; R. A. Baskett, public health clerk, East Ham Urban District Council; G. Ellison, sanitary inspector, Hornsey Urban District Council; A. Stratton, clerk, Port of London; A. G. Salter, clerk, Metropolitan Water Board; D. H. Pickard, sanitary inspector, Wimbledon Urban District Council; W. T. Carter, bath superintendent, Wimbledon Urban District Council; G. H. Williams, assistant sanitary inspector, Hereford City; and A. J. Franks, disinfector, Borough of Brighton.

2nd (Reserve) London Sanitary Company.

Captain Arthur J. Martin, M.Inst.C.E. (O.C.); Lieutenant F. G. Caley, tuberculosis officer, Wandsworth Urban District Council; staff-sergeant W. Hadingham, porter, Metropolitan Asylums Board; sergeants W. Gibb, clerk, Metropolitan Asylums Board, and S. Pickering, fitter, Metropolitan Asylums Board; corporals L. Skeeles, sanitary inspector, Southgate Urban District Council, and E. Tyler, disinfector, Wandsworth Borough Council; lance-corporal W. G. [illegible] Borough Council; privates L. Loughlin, sanitary inspector, Willesden Urban District Council; J. G. Francksen, public health clerk, Bermondsey Borough Council; G. N. Ede, rating surveyor, London County Council; A. P. Piggott, assistant surveyor, Stoke Newington Borough Council; J. Mernagh, hospital attendant, Metropolitan Asylums Board; W. E. Clark, clerk, Bermondsey Borough Council; R. Opie, assistant surveyor, Derbyshire County Council; P. Stebbing, architect, H.M. Office of Works; H. Steele, sanitary inspector, Dewsbury Urban District Council; R. H. Coad, public health clerk, Corporation of Burnley; T. M. Reed, sanitary inspector, Brandon Urban District Council; C. P. Page, assistant clerk of works, London County Council; A. Henessey, assistant sanitary inspector, Borough of Bacup; E. E. Riddell, sanitary inspector, Wath-upon-Dearne Urban District Council; E. F. Gibbon, sanitary inspector, Haverfordwest Rural District Council; G. F. Guy, assistant surveyor, Kingswinford Rural District Council; G. Lawson, assistant sanitary inspector, Edinburgh Town Council; G. T. Hill, sanitary inspector, Hitchin Rural District Council; E. Wilson, clerk of works, Borough of Westminster; G. H. Hammond, sanitary inspector, Borough of Leamington; T. T. Thomas, sanitary inspector, Holywell Urban District Council; C. Clerk, sanitary inspector, County Borough of Derby; R. McKenzie, sanitary inspector, County Borough of Lanark; E. Roberts, sanitary inspector, County Borough of Burnley; H. Aliffe, sanitary inspector, County Borough of Burnley; J. D. Keele, surveyor, London County Council; and W. Balchin, sanitary inspector, Heston and Isleworth Urban District Council.

DEATH OF MR. W. B. BRYAN.

CHIEF ENGINEER TO THE METROPOLITAN WATER BOARD.

We deeply regret to learn that Mr. William Booth Bryan, chief engineer to the Metropolitan Water Board, died suddenly in London on Tuesday night.

Mr. Bryan was born at Nottingham in 1848. He was educated at Nottingham Grammar School, and articled to Mr. O. Tarbotton, M.Inst.C.E., F.G.S. In 1870 he became assistant engineer to the Nottingham Corporation, and the Nottingham and Leen Valley District Sewerage Board; in 1873 he was appointed borough engineer and surveyor of Burnley; and in 1875 borough and water engineer of Blackburn, retaining until 1878 the post of engineer to the Sewage Committee of Burnley. In 1882 he was appointed chief engineer to the East London Waterworks Company, but remained as water engineer to the borough of Blackburn until the completion of new waterworks in the hills of the West Riding of Yorkshire and Lancashire. In 1904 he took up the appointment of chief engineer to the Metropolitan Water Board.

Mr. Bryan was a member of the council of the Institution of Civil Engineers, and a member of the Institutions of Mechanical Engineers, Water Engineers, and Municipal and County Engineers; was president in 1907 of the Junior Institution of Engineers; a Fellow of the Royal Meteorological Society; a member of the Franklin Institute, Philadelphia, and the New England Waterworks Association; and an honorary member of the Association des Ingénieurs et Hygiénistes, Paris.

New North Wales Road.—The new through road between Llandudno and Colwyn Bay, which is to be made by the two local authorities through a joint committee, with funds largely contributed by the Road Board, will find considerable employment for unskilled labour during the coming winter. At the last meeting of the Llandudno Council the clerk (Mr. Conolly) stated that at present the only cause of delay in the commencement of the work is as to the execution of one agreement with regard to the acquisition of land.

THE PRACTICAL TRAINING OF ENGINEERS.

SPECIAL COMMITTEE'S REPORT.

The report of the special committee appointed by the council of the Institution of Civil Engineers to inquire into the question of the practical training of engineers has been issued. The inquiry was undertaken as a result of the proceedings of the conference on the education and training of engineers held at the institution in June, 1911, and had as its main object to define and regulate the conditions of practical training for young engineers who might be able to satisfy the institution. Information was sought as to the usual practice, along with views of engineers with regard to suitable practical training for those who intend to become engineers, and as to the conditions under which such training might be rendered readily attainable by well-educated young men, and especially by those who have undertaken regular college study. The inquiry was summarised in nine questions, and information was invited as to the views, as well as the practice, of those who were approached upon the considerations involved in the several questions. The list of those to whom the questions were put was compiled in such a way as to ensure the inclusion of a considerable number of representative engineers in private practice, as well as of those in charge of public engineering administrations, and of manufacturing engineering firms. The report contains a numerical summary of the answers received from the following groups of engineers: (1) Engineers in private practice; (2) railway engineers, railway mechanical engineers, and dock engineers; (3) municipal engineers and engineers of waterworks and gas works; (4) manufacturing engineering—with, in addition, an analysis of the answers in each of the eight individual branches comprised in those groups. The committee learned with satisfaction that, while considerable uncertainty pervades the subject of practical training in regard to the details which should constitute it, there is a disposition among employers to consider favourably any proposals which may be thought likely to improve and define more clearly the conditions that should be observed for such training in the various branches of engineering practice; and that considerable interest is evinced in the matter of improving the co-ordination of scientific study and practical work, which was one of the important points remitted to the committee for their observations and recommendations.

COMMITTEE'S CONCLUSIONS.

The result of the inquiry and consideration of the views and opinions submitted led the committee to the following conclusions:—

(1) That, as the institution by-laws already provide for the necessary minimum period of practical training, and recognise the dependence of that period upon the educational and scientific attainments of the individual, it is unnecessary for the council to deal further with that point.

(2) That, without touching the question of what consideration should be involved for the privileges and opportunities of training—a matter in regard to which there is considerable diversity of practice—notably so in certain branches of engineering, it seems to be clear that some kind of agreement or defined arrangement is desirable where a young man seeks special opportunities of becoming conversant with a reasonably wide range of professional work, and where an engineer is willing to offer such opportunities within certain limits, either for a premium or in return for services rendered by the pupil.

(3) That it would be very useful to the institution, the engineer, and the pupil, if agreements relating to practical training were accompanied by statements containing in outline the heads of the several classes of work of which experience might be obtained during the period of training. Such a statement would assist, especially where there are no articles entered into, in making clear the position of a pupil as distinct from that of an ordinary assistant; and the production of such a statement of work, marked by the master to show what items had been dealt with during the period of training, would be of service to the council in deciding at a later stage as to the qualifications of a candidate for election.

From the very full information furnished to the committee in regard to the classes of work which are engaged in by learners in various branches of engineering, schedules have been prepared containing a synopsis of the more important features in eight groups or divisions of engineering practice, the basis of classification being that employed for the institution's periodical conferences. The waterworks and sewerage and municipal engineering schedules are reproduced herewith:—

Waterworks and Sewerage.	Municipal.
Designing and drawing.	Designing and drawing.
Estimating.	Estimating.
Specifying.	Specifying.
Taking out quantities.	Taking out quantities.
Structural calculations for iron and steel works, masonry, brickwork, concrete, timber, and earthwork.	Structural calculations for iron and steel work, masonry, brickwork, concrete, timber, and earthwork.
Surveying by chain and theodolite.	Surveying by chain and theodolite.
Levelling.	Levelling.
Parliamentary surveys and plans.	Parliamentary surveys and plans.
Gauging rivers and streams.	Gauging rivers and streams.
Meteorological observations.	Meteorological observations.
Borings and trial pits.	Borings and trial pits.
Testing and inspection of materials of construction.	Testing and inspection of materials of construction.
Setting out and Construction of	*Setting out and Construction of*
Excavations.	Excavations.
Earthworks.	Earthworks.
Roads and streets.	Roads and streets.
Culverts.	Culverts.
Embankments.	Embankments.
Retaining walls.	Retaining walls.
Tunnels.	Tunnels.
	Bridges.
Conduits.	Conduits.
	Pipe networks.
River intakes.	
Storage reservoirs.	
Service reservoirs.	
Earthen dams.	
Masonry dams.	
Filters.	Sewers.
Wells.	Sewage purification works.
Boreholes.	Sewage disposal works.
Pumping stations.	Outfall works.
Pipe lines.	Refuse destructors.
Sewers.	Tramways.
Sewage purification works.	Domestic drainage.
Sewage disposal works.	Public buildings.
Outfall works.	
Refuse destructors.	Fire prevention and appliances therefor.

It is not supposed that any individual could gain reasonable experience of more than a limited portion of the various items of work in these lists during the short period of a pupilage; but it is pointed out that information of the nature of the experience which has been obtained during any course of practical training will be useful to the council, and especially to the committee which deals with the preliminary qualifications of candidates for election. The schedules are not intended to imply or involve a direction to engineers as to the particular work in which they may find it desirable to employ their pupils; but they are expected to afford a convenient means of indicating what range of experience has been obtained. All cases of practical training, whether obtained in the capacity of a pupil, an apprentice, or an assistant, are required to be the subject of some arrangement or agreement, and where no articles or indentures are entered into, a statement of the arrangements made will have to be made where the person under training is recommended for admission as a student.

Finally, the committee's report—which has been adopted by the council of the institution—requests members to give special consideration to those who, having obtained exempting degrees and diplomas, desire to obtain practical training, whether as pupils, apprentices, or assistants under agreement, for the shorter periods allowed by the by-laws as a condition of election in the cases of men who possess those qualifications. The suggestion is made that some agency, such as the Civil Engineers Appointments Board, might be utilised to place in communication properly educated young men who seek such training with engineers who may indicate willingness to afford it.

Birmingham Corporation Employees and the War.—At a meeting of the Electric Supply Committee of the Birmingham City Council on Wednesday it was reported that as a result of the war 147 of the staff and workmen of a total of 645 were on active service, and that allowances were being made to them in accordance with the resolution of the City Council. The total amount paid at the present time was at the rate of £4,500 per annum.

The Functions of a Municipal Engineer.

By Prof. E. R. MATTHEWS, [illegible], Chadwick Professor of Municipal Engineering in the University of London.

(Conclusion.)

[illegible]

[illegible] road all.

[illegible] WATERING.

[illegible] to observe the waste of water and labour which occurs in the usual methods adopted in street watering. [illegible] road, 38 ft. wide. The water cart with its spreaders [illegible] 16 ft. Assume that the old-fashioned spreaders are in use, which do not admit of one side being shut off and the other only in operation; the result is that, to water the road the full width of 38 ft., the water cart must pass over the road three times. But 16×3 = 48, and all we require to water is 38 ft.; therefore 10 ft. of the road is watered needlessly. Water is thus wasted and labour, and the use of the horse, which might have been otherwise employed. The method I have adopted in watering a road, say, of that width is to water the sides of the road, including the channels, and to leave the centre of the road. I find that the dust on a road does not accumulate in the centre, but blows towards the channels, and this is where the watering is needed. The centre strip of the road need not, indeed, be watered. The Westminster City Council, I notice, are using a very useful motor vehicle in the shape of a cylindrical water cart, which probably holds 1,000 or more gallons of water, and this vehicle flushes the channels of the road in a very rapid way. I advocate the use of such.

I now propose to deal briefly with another branch of municipal engineering—namely, waterworks engineering—and to have something to say on the

[illegible] IN RESERVOIR CONSTRUCTION.

First let me set out some of the advantages of using this material.

There is a growing tendency on the part of engi[illegible] of Europe, to construct service reservoirs in reinforced concrete. A notable example of this may be quoted in the case of the new reservoir recently constructed at San Francisco. Mr. Shaughnessy, the city engineer of San Francisco, has—wisely, I think—used reinforced concrete in the construction of this reservoir. The advantages of using this material for this purpose are many:—

(*a*) There is a saving in first cost.

(*b*) A reservoir built in this material occupies less space than one constructed in masonry or brickwork, or a combination of both.

(*c*) It can more easily be made watertight.

(*d*) It increases in strength with age.

(*e*) There is less likely to be vegetation upon the face of the walls.

(*f*) Practically no cost in maintenance.

[illegible] RECTANGULAR RESERVOIRS.

In the United States most of the modern reservoirs are circular in plan. Reservoirs of this shape are seldom constructed in this country, British engineers preferring a rectangular structure. I recommend the circular shape, the chief advantage being that when of this shape no angles occur, so that the reservoir wall can be built without a joint. This is a great advantage, for one often finds that when leakage occurs in a reservoir it can be traced to the point where the walls join. Circular reservoirs, because of their circular form, are also better adapted to withstand external earth pressure; they are cheaper than rectangular ones.

The San Francisco new reservoir previously referred to is a good illustration of the circular type of reservoir. This may be briefly described as follows:—

The reservoir was completed about two years ago. It is known as the "Twin Peaks" reservoir, and is a good example of what may be done in reinforced concrete. It is oval in plan, and divided into two parts by a reinforced-concrete dam. The reservoir is situated 750 ft. above the business section of the city, and is part of the high-pressure system for fire extinguishing purposes established in consequence of the terrible fire of 1906. The dimensions of this reservoir are 370 ft. by 285 ft. in area, and the depth of water allowed for is 27 ft., or a capacity of 11,000,000 gallons. The buttresses of the dam are spaced at 9-ft. centres on both sides of the wall. They are 1 ft. in thickness, and 13 ft. wide at the base.

WATERTIGHT RESERVOIRS.

Referring to the leakage of reservoirs, we would say that this is a problem which has engaged the serious attention of engineers for many years past. Reservoirs have been constructed in what appeared to be a substantial manner, on a good foundation, and at a cost of many thousands of pounds, but they have never ceased to leak, and while many attempts at remedying the leakage have been made, these constructions are looked upon, from an engineering point of view, as a failure.

I know of no type of reservoir, however, which is more likely to be watertight than that constructed of reinforced concrete, provided the reservoir is properly constructed and expansion joints are inserted in suitable positions both in the walls and floor of the reservoir, and if suitable material is used for the concrete, and the walls are not less than a minimum thickness of 5 in., and are well reinforced, and that the depth of water in the reservoir does not exceed, say, 30 ft.

The thickness of the floor will depend entirely upon the sub-foundation. This floor may be either of plain or reinforced concrete; if the latter and the sub-foundation is good, the thickness of floor should not be less than 6 in. for a depth of water up to 15 ft., and 9 in. for a depth ranging from 15 ft. to 25 ft., and 12 in. from 25 ft. to, say, 35 ft. In every case it is assumed that the floor is well reinforced. In order that the reservoir may be watertight, in addition to the before-named precautions, great care must be taken as to the properties used in the concrete. I would suggest that never should a weaker mixture be used than 1:2:4, and where the depth of water to be stored is not less than, say, 20 ft., I would recommend a mixture of 1:1½:3. The materials should be very carefully graded, as most of the trouble in reservoir work occurs where this has been imperfectly done.

I also recommend that [illegible] mixture shall always be used, and while a dry mixture may show a better result as regards its strength in compression, and a plastic mixture may also give better results in this way, still a wet mixture more perfectly prevents leakage, and on that account should always be used.

Not only so, but with a wet mixture the reinforcement is better covered. I have seen reinforced-concrete work where a fairly dry mixture had been used, and where occasion had arisen for the breaking up of the concrete, where the reinforcement in places had not been covered in the least degree by the concrete. This had occurred, first, because the mixture was too dry, and, secondly, because the aggregate used was too large. In practice the concrete should be of such a consistency that every portion of the reinforcement will be well covered, and every crevice filled.

Not only is this obtained by using a wet mixture, but with such a mixture when the forms are removed there is a smooth face to the concrete, and on this account also it is wise that the mixture should be fairly wet. Care, however, must be taken to see that it is not too wet. It is possible for too large a quantity of water to be added so that the grout will run through the joints in the forms, and escape from the wall; on no account should this occur. If reservoir walls are constructed with a mixture of 1:2:4, the ultimate strength of this concrete, assuming well-graded stone and sharp sand is used as the aggregate, will be about 2,900 lb./in.² at the termination of one month, and 2,700 lb./in.² at the end of six months. The usual working stress for good concrete is taken at 600 lb./in.² Under exceptional circumstances, however, this may be reduced to, say, 500 lb./in.², but I would recommend, generally speaking, for reservoir work 600 lb./in.².

RESERVOIR PIERS.

These are sometimes built circular in plan, and there is a slight saving in the space occupied by so doing. It is, however, more costly to construct the form in the shape, and the advantage of saving in space does not many times repay the increased cost. The usual practice in this country is to build rectangular piers, and to round the edges, say, with a 1½-in. chamfer, 9 in. by 12 in. square pier. The square pier has the advantage that it affords a better seat for the roof-tie and for carrying the roof to rest upon.

RESERVOIR ROOFS.

In reinforced-concrete reservoirs the roof consists of a reinforced-concrete slab 4 in. or 5 in. in thickness, carried by reinforced-concrete beams which rest on the piers just described. Some engineers prefer a lighter roof, and to obtain this they introduce a system of secondary beams. For my own part I do not like the roof slab to be of greater thickness than 6 in., 5 in. is preferable, and the beams can be designed accordingly. In calculating the weight of the roof it is necessary to include the weight of concrete and reinforcement forming the beams and slabs, also to allow for any soil which may be spread on the roof. This is usually about 1 ft. or 18 in. in thickness, also to assume a thickness of snow of, say, 2 ft. It is necessary to construct two or three openings in the roof for the purpose of getting to the inside of the reservoir, and iron ladders are usually built in at these points. The openings need not be larger than 6 ft. by 3 ft.

CEMENT GROUTING.

It is always advisable after short sections of the work have been completed to wash the walls over with two coats of cement grout, 1 to 1 (sand and cement). This fills in any slight cracks which may have occurred on the surface of the concrete. A fortnight should elapse before the grout is applied. No further cracks on the surface of the concrete will be likely to occur.

WETTING CONCRETE.

If the reservoir is being built during the summer months, when the sun is likely to dry the surface of the concrete very rapidly, the latter should be frequently wetted so as to retard the drying action of the sun. It is also advisable to do this in high winds.

SIZE OF AGGREGATE.

In reservoir work the aggregate used in the construction of the walls, floor, piers and beams of the reservoir should be capable of passing through a ¾-in. ring; for the roof slabs it should be capable of passing through a ½-in. ring.

Where the thickness of the concrete floor exceeds 9 in. the aggregate should be capable of passing through a 1-in. ring, the upper 4 in. of the concrete in the floor should consist of concrete, the aggregate of which is capable of passing through a ¾-in. ring.

REINFORCEMENT.

It is not my intention to advocate any particular system of reinforcement. There are many in the market, and most of them are good, and I say this after having used several different systems myself. It is quite possible, however, and I strongly advise you to adopt this course, for the municipal engineer to work out his own stresses and design his own system of reinforcement.

THICKNESS OF WALLS.

For heads up to 10 ft. a 5-in. wall will generally be found to be sufficient; a 4-in. will answer, but I prefer a minimum thickness of wall of 5 in. It has, however, been suggested that the walls should be increased in thickness for every additional 5 ft. increase in head of pressure. I agree with this suggestion, but prefer that the top 6 ft. of the reservoir wall shall be 5 in. in thickness, and that the wall shall be increased in thickness by 2 in. for every additional 6 ft. of its height.

It is usually desirable to build counterforts or buttresses at the back of the wall.

There is a saving of from 20 to 25 per cent. by using reinforced concrete in the construction of reservoirs. Some engineers recommend that the water face of reservoir walls shall be rendered with 1 to 1 cement mortar to a thickness of ¼ in. or ⅜ in., but I do not favour this; I think it is unnecessary.

STRESSES.

The elongation of steel being so much greater than that of concrete, it is advisable, in order to ensure of the reservoir being watertight, to limit the stress to 12,000 lb/in.², and I think it is advisable in reservoir work to use bars which give a mechanical bond, such as the indented bar, twisted bar, lug bar, or one of the other various types of bars, rather than plain bars, but this only applies to reservoir work, as plain bars are admirable for all other reinforced-concrete work.

It is necessary that an adequate percentage of steel be inserted in the concrete in both directions, even when the stresses due to water pressure occur in one direction only, or otherwise slight cracks may occur.

Reservoirs may be—

(*a*) Entirely sunk below ground.

(*b*) Partly sunk below ground.

(*c*) Out of ground.

(a) Reservoirs sunk below ground.—In designing the first type we must remember that the reservoir may be full or empty. When empty the walls will be acting as retaining walls with all the pressure at the back; when the reservoir is full there is still the pressure of the soil at the back of the walls, but counteracting this is the water pressure from within. It is therefore desirable that walls of this class shall have reinforcement on both sides, and not in the centre of the wall, as had the reservoir which failed at Mittagong, N.S.W., as we shall see presently when considering that failure.

This reversion of stress due to the reservoir being alternately empty and full is one reason why we should adopt low working values. It is not advisable ever to make any allowance when designing a reservoir wall for the earth pressure at the back of the wall, which is counteracting the water pressure from within. The surrounding soil may during a long period of hot weather dry and shrink back from the wall; in such a case the earth pressure would be greatly reduced. Not only so, but it may be found necessary at some time to excavate the soil outside the reservoir.

(b) Reservoirs partly out of ground.—These are known as the cantilever type. In determining the width of the heel we must remember that in an ordinary retaining wall the weight of the earth at the back of the wall would help to keep the wall from overturning, but with a reservoir the weight of the water should be disregarded. The heel should therefore be made of sufficient width and thickness to be stable when the weight of water above it is neglected. One of the most important things to be careful with in designing a reinforced-concrete reservoir is the arrangement of the bars at the joint between the vertical wall and the footing.

(*c*) *Reservoirs out of ground.*—These will be similar in design, but buttresses are usually added. The wall acts as a dam to withstand water pressure.

RESERVOIR ROOF.

This often acts as a tie, and holds the reservoir walls together; the reinforcement is therefore arranged accordingly. When the span is large, however, the elongation may be considerable, and it is then not advisable to tie the walls in this way, but to give the roof free sides for expansion.

THE FAILURE OF A REINFORCED CONCRETE RESERVOIR AT MITTAGONG, N.S.W.

Engineers who are not in favour of the use of reinforced concrete are very ready to draw our attention to this failure; but this is unfair, for the reasons why the structure failed are quite clear, as we shall see in a moment.

We can always learn more from failures than from successes. This reservoir was 40 ft. diameter, and was built in connection with the water supply of Mittagong, N.S.W. It burst on January 22, 1909. It contained 32 ft. of water at the time of bursting. Once before it had been filled to a depth of 33 ft. 9 in. The reservoir was constructed on a solid rock foundation in an old quarry excavated 7 ft. deep on top of a steep hill, and when the structure burst the 240,000 gallons of water which it contained rushed down the slope; no damage was done, however. The lower half of the reservoir failed all round simultaneously; the upper half then collapsed.

The floor of the reservoir was 12 in. thick, and of plain concrete.

Design: Capacity of reservoir, 314,000 gallons; 40 ft. deep to top water level; shell of reinforced concrete, 4½ in. thick under coping, 10½ in. thick at bottom of wall, including ½ in. of rendering on inner face, and ½ in. on the outer surface.

[illegible]

[illegible] meters lap. All intersections were tied together with No. 16 wires.

Unit Stresses.—In designing the shell no allowance [illegible] that the steel rods would take the whole of the tensile stress due to water pressure.

The maximum tension in rods in the Mittagong reservoir at time of failure was only 12,750 lb.², although a tensile stress of 16,000 lb./in.² had been allowed for, and the adhesion was 80 lb./in.² at floor level. The tensile strength of the cement used at [illegible]

Method of Construction.—The concrete bottom was first put in, then the timber framing was erected to the full height of the reservoir; the grill was then put in place and tied. Concrete boards were then put in in lifts of 2 ft. The concrete was hand-mixed and rammed in place, 3-in. by 1-in. battens being used, as these were found to be best for working the concrete around the reinforcement. The shell was finished in thirty-one days, and the reservoir was filled ninety-eight days after completion.

Causes of Failure.—These are pointed out by Mr. de Burgh, M.INST.C.E., in a paper read by him before the Institution of Civil Engineers; they were:—

(1) Defects in design.
(2) Defects in material.
(3) Defective workmanship.
(4) Other contributing causes.

The cause of failure was not due to the use of excessively high stresses in the steel reinforcement, but in the failure of the joints between the various horizontal rods. The concrete was in places insufficiently rammed, and too dry a mixture had been used.

In my opinion, apart from defective design, the time of setting before use was insufficient, and the adhesion of the concrete to the reinforcement imperfect.

What do we learn from this failure?

CONCLUSIONS.

(*a*) In reservoir work a tensile stress of 12,000 lb. per square inch is sufficient.

(*b*) A single central grill is not the best design, as it produces a weak plane through the centre of the structure.

(*c*) An allowance of 50 lb. per square inch adhesion for plain rods is ample, and this should be reduced at those places where the rods cross one another, and so prevent the concrete at those points from surrounding the bars.

(*d*) The concrete should always be a "wet" mixture.

This reservoir has been rebuilt to an amended design, the old bottom remaining. In the new design 50 lb. per square inch has been allowed for adhesion, and the maximum tensile stress is 11,189 lb. per square inch; this occurs at 6½ ft. above the reservoir bottom. Instead of a central grill, there is now a double row of vertical bars in the bottom two-thirds of the reservoir wall, which, in my opinion, should have been included in the first design.

ASSISTANCE TO THE WAR OFFICE.

There are many ways in which a municipal authority may assist the War Office.

Camping Ground.—One of the principal of these is by the purchase of land in or near the borough for the purpose of allowing this to be used as a military or volunteer encampment or manœuvring ground. Many local authorities have inserted a clause in their recent Bills dealing with this matter. The Bridlington Corporation Act, 1904, for example, contains such a clause, which is as follows:—

"The corporation may purchase or take on lease and set apart any land in or near the borough which, on the application of the corporation, may be approved by the Secretary of State for a military or volunteer encampment or manœuvring ground, and they may equip such land for these purposes or any of them, and they may maintain or let the same, and they may contribute out of the borough fund to the cost of the purchase, taking on lease, equipping, and maintaining of any land for these purposes."

In my opinion all municipal corporations who have suitable camping grounds in their districts should assist the War Office in this manner. The fields can be let to the War Office at a reasonable rate, and the corporation should keep the approaches in good condition. They might also make additional approaches and temporary roads.

Water Supply.—They may also assist very considerably in the matter of providing a water supply to the camp, and should keep at their depot a fairly large supply of 1-in., 1½-in., and 2-in. wrought-iron service pipes, and a number of standpipes and stopcocks. Each standpipe should be fitted with a stopcock, so as to prevent waste of water, and to facilitate repairs to the standpipe if damaged by horses. They should also have in stock a good supply of 3-in. cast-iron water main, and a number of hydrants, so that, should a supplementary supply of water be required to be carried to any particular part of the camping ground, there will be no delay in waiting for the pipes and fittings to arrive, but they will be ready for use. A good supply of 4-in., 6-in., and 9-in. sanitary pipes is also very useful, as is also disinfectant.

Maps.—The municipal engineer should have in his office, in duplicate, 6-in. Ordnance maps of the town and district, and a 1 in. to the mile Ordnance map, in duplicate, showing, not only the town and immediate neighbourhood, but the country around for a radius of about 8 miles. These maps would be of great service to the War Office in peace times in connection with their manœuvring arrangements.

Site for Camp.—He will have a knowledge of the geological features of the district, and this will be very useful when advising as to the selection of a site for a camp, the dryness of the ground being a very important matter, especially where a temporary hospital is to be located.

Present War.—As to the assistance the municipal engineer may render to the War Office during the present war, we may say that, in addition to the help suggested in the foregoing paragraphs, the municipal engineer should encourage his pupils to offer their services to the War Office, and he should see that the pupil, as far as his articles are concerned, does not suffer, but that the period for which he is away from his work be added to the three years or whatever the term may be, which is the time to which the pupilage extends. Two of my pupils have joined the Forces under similar conditions.

Staff.—He should encourage his staff to join the Forces, although their doing so may be inconvenient to him. If necessary, he should arrange for temporary assistants to take their place, and he should get a guarantee from the corporation that the positions held by the members of his staff shall be kept open for them until the War Office can liberate them. My council at Bridlington have decided to make up the salary of each official + 5 per cent bonus, and 10 per cent if married.

Workmen.—If permanent men, their places should be kept open for them while they are away at the war. The Bridlington Corporation are making up their wage + 10 per cent bonus to married men, and 5 per cent to single men.

Horses, Carts, &c.—If Territorials or other regiments are camping in the neighbourhood of the town, the corporation should assist them as far as possible by allowing them to use their horses, carts, rullies, and particularly covered sludge carts. No doubt the War Office will be willing to pay for the use of these, and it often happens that there is a scarcity of vehicles of this kind, or that the corporation alone possess vehicles that are suitable.

Hoisting Tackle.—Most corporations are fairly well supplied with hoisting tackle, and the loan of this may be of great service at the camp. A contractor's pump is also a very useful thing in camp, and the corporation would usually be in a position to lend one of these.

Watchmen's Huts.—The loan of these as sentry boxes may also be of use.

Scaffold Poles and Barrels.—These are always useful, and at the corporation depot there will usually be found a good assortment of such.

Sanitary Measures.—The corporation should carry out the sanitary measures in connection with camps, as they can do it more thoroughly than a contractor.

Weak Bridges.—The municipal engineer should make a careful inspection of the bridges in his district over which there is likely to be heavy traffic, and should see that any weak bridges are made safe.

Interference with Water Supply, Electricity, &c.—He should take every precaution to see that the supply

The Surveyor

And Municipal and County Engineer.

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of water, electricity, gas, &c., to the town are not interfered with by spies.

Employment in Cases of Distress.—The municipal engineer should urge his authority to proceed with those works in which there is likely to be a maximum of labour. Road widenings, and road making generally, sewerage and similar works involve chiefly labour, and therefore are suitable, and these should be proceeded with in order to find employment in case of distress.

Assistance to Neighbouring Authority.—He should be prepared to offer his services, in an advisory capacity, to an adjoining authority, where the engineer may have gone to the Front, and has not a reliable deputy to leave in charge.

Ambulance Work.—He should encourage the employees to take up ambulance work, and in this connection he might allow them an occasional hour off to attend classes.

Aircraft.—When military or naval aircraft are visiting a town, the municipal engineer may be of great assistance in pointing out suitable places for the accommodation of same. If the visit is only a very temporary one (a matter of a few hours), he may assist by roping in the aeroplane, and instructing one of his employees to keep the public from interfering with it.

CONCLUSION.

I have endeavoured, in this lecture, to show that the duties of the municipal engineer are exceedingly important, and that they are becoming more so in consequence of recent legislation. I would conclude by saying that the municipal engineer, while he must have a thorough knowledge of his profession, must, above all else, be a man of tact. Unless he be a tactful man he will not succeed. His council will be composed of men in various stations of life, with different outlooks, ideas, political opinions, and religious beliefs, and only the man of tact can successfully serve them. If he is wise he will not parade his politics on every possible occasion. My last word, and this time to the student, is: Do well whatever you take in hand. Take as much pains over the trivial as the important, remembering that nothing is really trivial, and that the genius of success is nothing more than doing well whatever you do.

Tar-treated Roads in the North Riding.—The report of the Highways and Bridges Committee, which was submitted on Wednesday at the quarterly meeting of the North Riding of Yorkshire County Council, contained the statement that further complaints had been received as to the slippery state of some sections of tar-macadam on the main roads. The matter had again received careful consideration, and orders had been given for grit or sand to be distributed on the slippery surfaces when required.

ROAD MAINTENANCE IN WARWICKSHIRE.

The maintenance of the 457¼ miles of roads in the county of Warwickshire cost, in the last financial year, £122·8 per mile. In his annual report, Mr. John Willmot, the county surveyor, states that the average number of men employed on the roads, excluding those engaged on Road Board work, was 218. The cost of materials, including stonebreaking, was £19,047.

The quantity of granite and other hard stone purchased, exclusive of pebbles, was 31,509 tons, and the cost, including breaking, was £13,057, giving an average price of 8s. 3d. per ton. The quantity of tarred material used, exclusive of that put down under contract, was 1,920 tons, one-half of which was used for patching purposes. The average price of this material was 12s. 3d. per ton. For strengthening the sides of the roads, and putting in foundations where required, 13,898 tons of slag and 561 tons of rubble have been used. The average price of the former was 5s. 3d., and of the latter 5s. per ton. The railway rates have all been increased, and in Warwickshire the effect of this increase has been to add about 1½d. per ton on the material all round as compared with the rates paid in the previous year.

TEAM LABOUR.

The quantity of material hauled by piecework on to the roads from the various wharves, railway stations and quarries was 57,158 tons, at a cost of £4,569, which is equal to a rate of 1s. 7d. per ton. The average cost per ton per mile was 7·7d., as against 7·5d. for the previous year.

Mr. Willmot points out that the difficulty of obtaining an efficient supply of horses and carts for this work increases each year. During last year steam tractors were used to a limited extent where large quantities of material had to be drawn from one station. The tractors are, he states, more serviceable, but the cost was no less. The council recently purchased a combined steam roller and tractor. So far this has been used chiefly for hauling purposes, and has proved exceedingly useful, and Mr. Willmot hopes in his next report to furnish some information as to the cost of working.

SURFACE TARRING.

The surface tarring was, on the whole, carried out under favourable conditions as regards the weather, and a much larger area was treated than in previous years. About 60 per cent of the work was done by contract, and the remainder by the council's own men. The work cost £4,636, and the area treated was 829,628 sq. yds., equal to about 90 miles of road in length, or one-fifth of the total mileage directly maintained by the council.

There is very little difference in the cost per square yard of the work done by contract and that done by the council's own men, the latter being ·11d. cheaper than the former. There is, however, in the opinion of the county surveyor, not the slightest doubt that the work done by the council's men was much the better, and the results more lasting.

ROAD BOARD SCHEME.

This scheme provides for strengthening the foundations, where required, and surfacing with tarred material slightly over 40 miles of road at an estimated expenditure of £76,450. Good progress has been made with the work. The council's own men are doing all the strengthening and foundation work necessary, and after this has been done the roads are being surfaced with Tarmac, by Tarmac Limited, at contract prices. At the end of the financial year, about 20 per cent of the work had been done.

Council Chairman and Steam Rollers.—At the last meeting of Newmarket Urban District Council a committee stated that they had considered a further report from the surveyor upon the question of the purchase of a steam roller, and had resolved to recommend that the council advertise in The Surveyor newspaper asking for quotations; and that a specification of a suitable roller be prepared, tenders to be invited upon it. The surveyor was authorised to inspect certain road rollers at work in various districts. Mr. Hambling asked whether the council wanted to have the specification before them. The chairman: It is a technical matter. We had better leave it to the surveyor, I think. Mr. Hambling referred to the type of roller to be selected. The chairman: That is a question for experts, which we are not. The clause (states the *Newmarket Journal*) was adopted.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain.
Each man's opinion freely is his own
Concerning anything, or anybody.
MASSINGER "The Fatal Dowry," Act ii., 2

THE TRAINING OF MUNICIPAL ENGINEERS.

To the Editor of THE SURVEYOR.

SIR,—The [illegible] that a [illegible] notes are [illegible] by Mr. Platt's remarks in the "Report of the Special Committee on the Practical Training of [illegible] to the Institution of Civil Engineers."

I [illegible] to the agreement with Mr. Platt [illegible] p. 27 "[illegible] men are not qualified to teach, and their offices are not worth bothering about." [illegible] that it would be better [illegible] a [illegible] member of the Institution [illegible] take pupils [illegible] deteriorate [illegible] are [illegible] members [illegible] as large as Rochdale [illegible] Mr. Platt [illegible] quoted [illegible] and the distinction M.Inst.C.E. [illegible] distinction that is any other [illegible] letters on the plate!

Mr. Platt seems to think that the evils of the pupil system are only rampant in the small districts (p. 28), and he [illegible] also [illegible] suspicions of the "small" man (p. 30). I would recommend to them Mr. Brodie's epigrammatic reply: "A man doing small work, if he is doing it well, is often a good man." I may say at once that my work is at present in a small district, and no doubt Mr. Platt, from his lofty pinnacle, would have a difficulty in descrying it with a powerful [illegible], but, nevertheless, "small" is a comparative term; there are orders of smallness, and my district is, in fact, larger in proportion to Mr. Platt's [illegible] than his is in proportion to Mr. Brodie's. It might even have occurred to Mr. Brodie and to Sir M. Fitzmaurice that so important a work as borough engineer of Rochdale was somewhat of a small order, though evidently this point of view has not occurred to Mr. Platt. It must be borne in mind, however, that the majority of municipal engineers are concerned, on the whole, with small things, and it is the daily routine, which is the most important, and not the larger but less frequent special works, though these bulk more largely in an account of the municipal work of a district. In my opinion, and, I venture to say, in the opinion of many other surveyors who have had experience of both, large and small districts, the best training for a municipal engineer is to be obtained in a town of 30,000 to 50,000 inhabitants. In such a town the supervision of the town council and the general public is so close, and any increased expenditure has such an immediate effect on the rates, that the well-known definition of an engineer being one who can do for 1d. what any fool can do for 2d. is the usual standard by which to test the municipal engineer; whereas in a large town, where things are more under the control of the officials and the chairmen of committees, and things are done in a more hole-and-corner manner, the engineer can at times on occasion fool away two or three thousand pounds almost unnoticed. Efficiency, economy, attention to detail, correct and systematic records of work [illegible] can be and are as well practised in a small town as a large one, and in a small town the pupil has a chance of grasping the entire scheme of things, and thus fitting himself for taking charge of a district, whereas in a large town he becomes a mere cog in the wheel, and has a grasp only of his own special department.

My experience of the pupil system in a large town of a population of upwards of 100,000 may interest you. The borough engineer was allowed to take two pupils. They usually came on a three years' agreement at a premium of 150 guineas, so that one finished(!) pupil was turned out every eighteen months, and the engineer was 100 guineas a year in pocket. This was not a "small" district, where the engineer was underpaid, and had to eke out his salary by premiums, as is so often suggested is the case in a small district, but a place where the office was well staffed and the borough engineer well paid. The only preliminary qualification of the intending pupil was the possession of the "dust," and this having been planked down, the pupil was turned loose in the office to shift for himself. Of the number who passed through the office while I was there, one was a B.Sc. and public school man, and an unmitigated nuisance, who would neither work himself nor let anybody else work; another was the son of wealthy parents, who, except for being without the B.Sc. degree, was not much different to the first mentioned, which another might not have been made into an engineer in a thousand years.

As to whether the training received and the prospects opened up are worth paying a premium for [illegible] The weakness of the pupil system is shewn by Dr. Cowan's remarks on p. 28: "Some of the ablest lads we have to deal with are lads who cannot pay a premium. . . . It is a serious thing if the ablest young men cannot get practical engineering training."

In conclusion, though it may be accounted heresy to say so, I think the possession of the certificate of the Institution of Municipal and County Engineers ought to carry more weight with municipal engineers than the possession of the Assoc.M.Inst.C.E. qualification, as the Municipal and County Engineers' examination is for them an infinitely better test than the Assoc.M.Inst.C.E. examination. I think the Institution of Municipal and County Engineers would do their profession more good by putting all their energies into raising the status of their institution rather than being content to allow it to remain an understudy to the Institution of Civil Engineers. Yours, &c.,

A "SMALL" CORPORATE MEMBER.

London,
October 26, 1914.

BRITISH FIRMS.

To the Editor of THE SURVEYOR.

SIR,—We enclose herewith particulars regarding Messrs. Dussek Brothers & Co., Limited, and ourselves, and perhaps you will kindly publish this information in your columns:—

MESSRS. DUSSEK BROTHERS & CO., LTD.

1857—Business founded by A. L. Dussek, British subject, born in London.

1889—Transferred to Dussek Brothers & Co. Partners: A. S. Dussek, A. L. Dussek (sons of the founder) and J. Webster, all British subjects born in London.

1905—Converted to private limited company. Directors: A. S. Dussek and Colonel H. A. Christmas. The whole of the capital is held by British subjects. All employees are British subjects.

THE DUSSEK BITUMEN COMPANY.

1904—Founded by A. E. H. Dussek and A. S. Dussek (director of Messrs. Dussek Brothers & Co., Limited). All the capital is held by the above two partners, and employees are British subjects.

Colonel H. A. Christmas is now serving his country. E. A. Dussek is with Lord Kitchener's Army, and A. S. Dussek (natural volunteer), A. E. H. Dussek and L. A. Dussek are training in volunteer forces.

Yours, &c.,

THE DUSSEK BITUMEN COMPANY.

Canal Bank,
Deptford, S.E.
October 23, 1914.

CAMP SANITATION.

To the Editor of THE SURVEYOR.

SIR,—I have read with considerable interest Mr. Hartfree's article on "Camp Sanitation" in your last issue. Such an article appears at a very opportune moment, as no doubt many surveyors in this country have now to take charge of concentration camps, as well as to advise the military authorities on many sanitary questions. I trust that any of your readers who have any special knowledge of camp sanitation will favour us with their views.

Would it be possible also to obtain from some of the surveyors or assistants who have joined Kitchener's Army some account of their experiences? There must be many men with a practical knowledge of sanitation either serving at the front, or in camp in this country, or in barracks or billets. It would be of the greatest public value if these men could furnish us, through the medium of your largely read paper, with some of their experiences, their criticisms and suggestions for improvements. It may be difficult to communicate with them, but if this letter is seen by any of their friends it would be of public service if they could be written to upon the subject.—Yours, &c.,

H. PERCY BOULNOIS, M.INST.C.E.

7 Victoria-street, S.W.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

433. Mechanics. Show how to find the periodic time of the complete vibration in a case of simple harmonic motion, and give a proof of the necessary formula.

434. A Question in Statics. A light rod, of length 3 ft., whose weight is neglected, has equal weights attached to it, one at 9 in. from one end and the other at 15 in. from the other end. If it be supported by two vertical strings attached to its ends, and if the strings cannot support a tension greater than the weight of 1 cwt., what is the greatest magnitude of the equal weights? (H. P. M., *Tewyn.*)

435. Damp Prevention.—Show by sketches three methods of preventing moisture in the soil from rising into a brick wall: (*a*) an ordinary 14-in. wall, (*b*) a 16-in. cavity wall, (*c*) an 18-in. basement wall.

436. Ventilation.—What effect has (*a*) the breathing of animals and (*b*) the combustion of fuel upon the purity of the atmosphere? (T. R.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

430. Materials. In what respects do Portland and Roman cements differ, and in what circumstances is the latter used? ("Beginner.")

Portland cement may be termed a composite cement, and Roman cement a natural cement. The former contains roughly 60 per cent lime, 20 per cent silica, 5 to 10 per cent alumina, and small quantities of various alkalies, oxides, &c. It is prepared by combining limestone rock and slag in a battery of washmills, warm water being added, forming what is known as a slurry. The substance is then tested and screened, being afterwards conveyed to tanks provided with mechanical stirrers. It is then burnt in a rotary kiln, and passes to a rotary cooler in the form of clinker. This clinker is then crushed and passed successively through various mills until the required degree of fineness is obtained. There are three distinct types of Portland cement—"quick-setting," which sets in from ten to thirty minutes, "medium-setting," taking from thirty minutes to two hours, and "slow setting," which occupies from two to seven hours in the process. Roman cement is prepared by calcining at a low temperature nodules found in the London clay and in the shale beds of the lias formation. It contains 40 per cent of clay, and is a rich brown in colour. Whereas Portland cement weighs about 112 lb. per bushel, Roman cement only weighs 75 lb. It has many disadvantages, being only one-third the strength of Portland cement, and having to be kept in barrels. If it is exposed to the atmosphere it becomes inert. It sets rapidly—in about fifteen minutes—and was largely used for tidal works, where rapidity of setting was very important; but lately it has been almost entirely superseded by the "quick-setting" Portland cement. (P. H., *Middleton.*)

Cements are either natural or artificial. Roman cement is the best-known natural cement in this country. It is made by burning nodules containing some 30 to 45 per cent of clay, found in the London clay. Portland cement is an artificial compound made by mixing chalk and clay in water in the proportion of about 3 parts of chalk to 1 part of clay. The mixture is then dried and burnt in kilns, the resulting clinker being ground extremely fine, so that 90 per cent of it will pass a sieve having 2,500 meshes to the square inch. The weight of Roman cement is about 75 lb. per bushel, that of Portland cement being about 115 lb. per bushel. They differ very much in colour, Roman cement having a rich brown colour, while Portland cement presents a greenish-grey colour. Roman cement sets in about fifteen minutes, but its ultimate strength is very small. It should never be exposed to the atmosphere, as it absorbs carbonic acid (CO_2) with ease, and thus becomes useless. Portland cement, on the other hand, must be thoroughly cool when used—all the lime in it thoroughly air-slaked—otherwise it may swell in the work when finished and cause much damage. In order to cool it, it should be spread out on a floor protected from the weather, and turned over daily for some weeks, so that every part of it may become thoroughly air-slaked. It will set either in the air or under water, becoming hard in twenty-four hours, attaining considerable tensile strength in seven days, and in course of time a strength far greater than that of any other cement. A good cement, after setting seven days under water, is expected not to break under a less stress than 355 lb. per square inch. Previous to the introduction of rapid-setting Portland cements, Roman cement was largely used for tidal work, and other work where rapidity of setting is necessary. It is, however, rarely used for such work now. Roman cement is also used for stucco and plasterers' work in general, where great strength is not needed. It is not used for mortar or concrete. (T. W. P., *Bexhill-on-Sea.*)

These two cements differ in colour; Portland cement has a greenish-grey colour, and Roman cement has a rich red-brown colour. Roman cement sets very rapidly, due to the presence, in high percentage, of alumina, and is only one-third the strength of Portland cement; it is much weakened by the addition of sand, which should never be used in a greater proportion than 1 to 1. Roman cement, on exposure to the atmosphere, absorbs carbonic acid and becomes useless; Portland cement, on the contrary, improves by being exposed to the air before being used, as the particles of free lime are rendered inert, while the setting quality of the cement itself is not affected. Roman cement is chiefly used for tidal and other work, where rapidity of setting is a necessity; but since the introduction of the more rapid-setting Portland cements, the use of Roman cement has been almost entirely superseded. (W. D., *Dudley.*)

431. Water Supply.—Explain the difference between surface springs and deep springs, and state the geological conditions in which each occur.

The original source of all available water supply is rainfall. Of the whole rainfall, part evaporates into the air, part percolates by surface drainage and forms rivers, and part sinks into the ground and forms the underground supply. The underground supplies are known as springs, and these

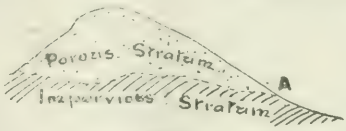

FIG. 1.

may be divided into two classes—viz., surface springs and deep springs. Surface Springs.—The rain falling on the ground will percolate downwards until it is stopped by an impervious stratum of the earth. It will then issue from the ground at the lowest point of the porous stratum. This is an instance of a surface spring. The sketch shows a

[illegible] of a hill where such a spring might exist, [illegible] at A. Deep springs or Deep-seated springs are they are sometimes called. Fig. 2 shows an example of a [illegible]

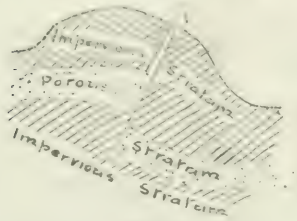

Fig. 2.

spring. Owing to a "fault" in the strata, the water is prevented from percolating downwards, and so finds an outlet upwards at the point A. Another

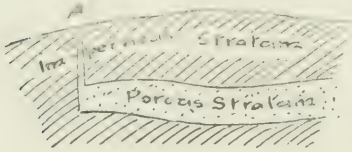

Fig. 3.

example is shown in Fig. 3, where the water, finding no natural outlet, issues upwards through some weak point in the stratum at A. (G. W. C.)

INSTITUTION OF CIVIL ENGINEERS.

AWARDS FOR PAPERS.

In addition to the awards announced in April for papers read at the meetings, the council of the Institution of Civil Engineers have made the following awards for papers published in the "Proceedings" without discussion during the session 1913-1914:—

A Telford Gold Medal to Mr. J. V. Davies (New York); Telford Premiums to Messrs. W. C. Popplewell (Manchester), A. J. Knowles (Cairo), H. Gaskell, junr. (Widnes), P. Rothera (Trichinopoly); the Crampton Prize to Mr. H. F. Carew-Gibson (London), and the Manby Premium to Mr. W. M. Griffith (Bareilly, India). The Webb Prize for the best paper on railway machinery published during the past three years has been awarded to Mr. Henry Fowler (Derby), and the Indian Premium for 1914 to Mr. P. Rothera (Trichinopoly).

The council have made the following awards in respect of students' papers read during the session 1913-1914: The "James Forrest" Medal and a Miller Prize to Mr. J. E. Swindlehurst (Birmingham), and Miller Prizes to Messrs. T. C. Grisenthwaite (Glasgow), H. J. C. Harper (Bristol), W. P. Nevett (Birmingham), J. M. L. Bogle (Manchester), E. A. Cross (Birmingham), S. Brassey-Edwards (Manchester), G. T. Cotterell (Bristol), D. D. Stanier (Newcastle), W. E. Gurry (London), H. Taylor (Birmingham) and R. C. Rattray (Manchester).

Fire Precautions for Belgian Refugees.—The British Fire Prevention Committee has issued a special fire warning for buildings in which Belgian refugees are being temporarily housed. This fire warning is obtainable not only in the English language, but in French and Flemish translations. The dangers of matches, candles, oil lamps, spirit cookers, smoking, celluloid and so forth are pointed out in concise language, and, having regard to the fact that many of the refugees are neither used to the open fires or ranges customary in England, nor to gas lighting and electric lighting, these fire preventive hints, if suitably displayed at the various hostels and homes, should be eminently useful to them. Copies of the warning can be obtained upon written application (giving requirements as to language) addressed to the Registrar, The British Fire Prevention Committee, 8 Waterlooplace, London, S.W.

PRO PATRIA.

[EIGHTH LIST.]

We present herewith an eighth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Bone, Hugh, assistant in the borough engineer's department, Falmouth, the Engineering Unit, R.N.D., Oxney, Eastern Camp, Ringwold.

Bullock, Sydney, notice clerk, private street works department, Stoke-on-Trent Corporation, B Squad., Staffordshire Yeomanry.

Clough, Edgar, assistant in the borough engineer's department, Wigan, 5th Battalion, Manchester Regiment (Territorials). Now on foreign service in Egypt.

Fox, F. St. G. J., assistant city surveyor, Lichfield, 3rd Battalion, Birmingham Regiment (Kitchener's Army).

Higgins, D., assistant surveyor, East and West Molesey, Sportsmen's Battalion, Royal Fusiliers (Lord Kitchener's Army).

Hossack, W. B., assistant road surveyor, Middle Ward District, County of Lanark, 2nd Lieutenant, Lowland Divisional Royal Engineers (Territorials).

Lines, G. W., clerk, borough engineer and surveyor's department, Fulham, 9th Lancers (Lord Kitchener's Army).

Locker, A. B., accounts clerk, Stoke-on-Trent Corporation, Northumberland Fusiliers (Reservist).

Richards, J. M., engineering assistant to the Abersychan Urban District Council, London Sanitary Section of the Royal Army Medical Corps.

Snell, C., deputy surveyor to the Abersychan Urban District Council, London Sanitary Section of the Royal Army Medical Corps.

Twentyman, Edward, pupil of Mr. H. C. Marks, city engineer and surveyor, Carlisle, Engineering Societies Battalion, R.N.R.

Yarker, Alfred F., assistant clerk in city engineer and surveyor's department, Carlisle, trooper, Westmorland and Cumberland Yeomanry.

Mr. Alec Ernest Dixon, of the borough engineer's department, Southampton, has been gazetted lieutenant-commander in the Royal Naval Volunteer Reserve, and is in command of a well-equipped, speedy motor boat which he has placed at the disposal of the authorities for despatch carrying and scouting.

The Manchester School of Technology possesses particulars of more than 550 students who were in attendance at the college during the academic year 1913-14, and who are now serving in various branches of His Majesty's Forces. With a view to the completion of a Roll of Honour, which shall also include the names of past students engaged upon military service, the Registrar will be glad to receive any information from such persons themselves or from their relatives or friends.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

Nottingham a Port. Nottingham Corporation by a large majority on Tuesday decided to proceed with important works, towards the cost of which the Development Commissioners have promised an advance of £50,000, the ratepayers contributing £100,000. The scheme is to improve the navigation of the river Trent between Nottingham and Newark, and it was urged the effect of the proposal would be to make Nottingham an important inland port. Employment would be given to many unemployed by the scheme.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Dunfermline T.C. (October 2nd. Mr. J. C. Pearson.—This was an application by [illegible] a Provisional Order with the object of the [illegible] undertaking [illegible] the construction of works for providing an improved water supply [illegible] the burgh. The cost of the proposed scheme, which includes the laying of a main pipe between Glen[illegible] and Glassford[illegible] to supply, the enlargement of the storage capacity at Craigluscar, and the construction of a distributing tank [illegible] 275,000. Mr. [illegible] K. [illegible] that the town council had agreed to withdraw that part of the Order relating to the construction of a third reservoir at Craigluscar, and pointed out that the council had not intended to proceed with that work for at least ten years. They would only re[illegible] the application [illegible] when Rosyth has so far developed that they would need extra storage to ensure a two days' supply for the community.

Evesham R.D.C. (October 23rd. Mr. M. K. North).—£2,500 for works of water supply for the parish of Harvington.—Mr. Wadams, the clerk, stated that the application was for an extension to the scheme for villages water supply already carried out by the Evesham and Pebworth Joint Water Committee. The scheme was explained by Mr. J. E. Willcox (Messrs. Willcox & Raikes), who said the water would be obtained from Littleton reservoir, which is supplied by springs on the Cotswold Hills, a distance of some 14 miles away, other villages [illegible] supplied [illegible].

St. Columb R.D.C. (October 22nd. Mr. R. G. Hetherington).—£210 for the purchase of a site for the erection of working-class dwellings and £350 for the drainage of Atlantic-terrace, Trevone Bay.—Evidence was given of the demand for cottages. With respect to the second application, strong opposition was offered by [illegible] and property owners, who alleged that the scheme is inadequate.

Settle R.D.C. (October 20th. Mr. F. O. Stanford). £900 for sewage disposal at Eaglesham. The extension of the sewerage is necessitated by the development of the new colliery village. Plans have been passed for 108 cottages, and they are now in course of erection. It was stated that the matter was so urgent that the work had been commenced before application had been made to borrow the money.

Wallasey T.C. (October 26th. Mr. Courtenay Clifton).—£11,546 for the erection of thirty-two dwelling-houses and eighteen cottage flats on land between Poulton-road and Lowe-lane, Poulton.—The town clerk, Mr. H. W. Cook, stated that rehousing operations became necessary owing to certain demolitions during the extension of the Wallasey tramways, and at a future date the corporation expected to be in a position to submit a further representation to the board with regard to 51,912 sq. yds. of land purchased for allotment gardens, recreation grounds, and housing. The estimated nett receipt from rent was £866 6s. 6d., while the estimated expenditure for all purposes was £6 12s. 7d. less than that sum. There was thus an estimated balance of receipts over expenditure of £6 12s. 7d. per annum. The rents of the houses ranged from 6s. 10d. to 8s. a week, and of the cottage flats from 4s. 2d. to 6s. 6d.

APPLICATIONS FOR LOANS.

Buxton U.D.C.—£2,335 for the purposes of electricity.

Coventry T.C.—£2,025 for a rehousing scheme, and £4,915 for sanitary conveniences.

Ilfracombe U.D.C.—£[illegible]27 for making up a road.

Kidderminster T.C.—£31,000 for works of sewage disposal.

Leek U.D.C.—£3,660 for laying out Brough Park.

Listowel R.D.C.—£7,600 for works of road improvement.

Ostwaldwistle U.D.C.—£1,550 for street improvement schemes.

Ramsgate T.C.—£526 for road widenings.

Rothwell U.D.C.—£2,100 for works of water supply.

St. Germans R.D.C.—£950 for sewage works at Crafthole.

St. Ives (Cornwall) T.C.—£1,188 for road improvement.

Southall U.D.C.—£13,250 for workmen's dwellings.

Southend T.C.—£1,800 for surface-water drainage.

Twickenham U.D.C.—£6,240 for road improvement.

Tynemouth T.C.—£6,025 for repaving works.

Wem R.D.C.—£2,000 for works of water supply.

Yarmouth T.C.—£6,280 for schemes of improvement.

LOANS SANCTIONED.

Chesterton R.D.C.—£650 for the erection of workmen's houses.

Dewsbury T.C.—£3,100 for the purchase of Earlsheaton Hall estate for public walks and pleasure grounds.

Godalming T.C.—£2,000 for under-draining at the sewage farm.

Hemel Hempstead R.D.C.—£3,790 for a housing scheme.

Orsett R.D.C.—£14,520 for the South Ockendon sewage disposal scheme.

Pebworth R.D.C.—£196, additional loan for the Honeybourne housing scheme.

Reading T.C.—£6,750 for road improvement.

Rowley Regis U.D.C.—£3,098 for laying out a cemetery.

Tendring R.D.C.—£1,500 for water supply works.

Wath R.D.C.—£938 towards the cost of hospital extension.

Withernsea U.D.C.—£2,500 for water main extensions.

FORTHCOMING INQUIRIES.

NOVEMBER.	£
2.—**Derby.** For the provision of sanitary conveniences (Mr. R. H. Bicknell) ...	3,070
2.—**Twrcelyn.** For a housing scheme (Mr. W. H. Collin)	2,455
3.—**Bury.** For road improvement (Mr. R. H. Bicknell)	4,500
3.—**Dewsbury.** For works of sewerage (Major C. E. Norton)	3,200
3.—**Hendon.** For works of street improvement (Mr. M. K. North)	27,726
3.—**Holywell.** For a housing scheme (Mr. W. H. Collin)	13,500
3.—**Lewes.** For works of sewage disposal (Mr. R. G. Hetherington)	22,384
3.—**Nantwich.** For works of sewage disposal (Mr. A. W. Brightmore)	17,000
3.—**Risca.** For a housing scheme (Mr. H. S. Stewart)	59,800
3.—**Stanley.** For the provision of a park (Mr. Edgar Dudley)	3,000
4.—**Bridgwater.** For a housing scheme (Mr. H. S. Stewart)	1,000
4.—**East Preston.** For works of sea defence and road improvement (Mr. R. G. Hetherington)	1,000
4.—**Llangefni.** For the purchase of the town hall and market (Mr. A. W. Brightmore)	4,250
5.—**Bexhill.** For works of drainage and road improvement (Mr. R. G. Hetherington)	1,538
5.—**Shepshed.** For a housing scheme (Mr. W. H. Collin)	1,450
5.—**Wincanton.** For a housing scheme (Mr. H. S. Stewart)	2,500

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Liverpool, Tynemouth; housing and town planning—Leeds; roads and materials—Bethnal Green, Bolton, Bootle, Bradford, Bromley, Cumberland, Lancaster, Lewisham, Southwark; sewerage and sewage disposal—Banbury, Colwyn Bay, Kidderminster; water, gas and electricity—Perth. Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

ADMINISTRATION.

Down C.C.—The county surveyor, Mr. James Heron, has submitted to the Proposals Committee a report on the duties and salaries of the assistant surveyors, in which he lays emphasis upon the increasing importance of the work of these officers since the introduction of fast and heavy motor traffic. He adds that further inspections of the roads should be made, and concludes: "I reckon that to make these inspections would, on the average, entail each assistant surveyor travelling at the very least 5,308 miles in the year, but probably considerably more, not including the mileage for special inspections. That is, the mileage which it is now necessary to travel is at least double what it formerly was, and the duties to be performed are correspondingly increased. All the assistant surveyors have provided themselves with motor vehicles, either cars or cycles. Without these it would be impossible to carry out the work. I am, for the reasons given above, of opinion that the salary fixed in 1899, beginning at £120 per annum, to include travelling expenses, is now inadequate." The Proposals Committee have recommended that the Local Government Board be requested to issue an order amending the conditions under which the assistant surveyors were engaged, so as to reduce the number from twelve to eight, making them whole-time officers, or to such number as the county surveyor considered adequate.

Glastonbury T.C.—The duties of the borough surveyor, Mr. G. Alves, were the subject of a report by the Finance Committee recently. The committee considered that much of the borough surveyor's time was taken up with work which could be performed by a junior clerk, and that he worked much overtime and was unable to assist on applications being made to him in business hours owing to his having no separate office. The further consideration of the best method of meeting the difficulty was deferred.

BUILDINGS.

Coventry T.C.—The General Works Committee recommend the erection of public conveniences, at an estimated cost of £4,915.

Devonport T.C.—The Parks Committee have submitted to the council a recommendation for building a bandstand at Alexandra Park, at an estimated cost of £300.

Liverpool T.C.—Plans have been prepared of the proposed baths at Picrhead. The scheme is estimated to cost £70,000.

Manchester T.C.—The Parks and Cemeteries Committee propose to erect, at a cost of £450, a wooden building for the social and recreative life of the soldiers in training at Heaton Park.

Portsmouth T.C.—The borough engineer, Mr. A. W. Ward, has been instructed to prepare an estimate of the cost of making a concrete sea wall along the Stamshaw front.

Taunton T.C.—A decision has been reached to purchase a site for £450 for the purpose of a swimming bath, at an estimated cost of £2,550. The scheme of the borough surveyor, Mr. D. Edwards, is to build a swimming pond 95 ft. by 36 ft., and to provide six or eight washing baths, and other necessary accommodation.

Tynemouth T.C.—The council have adopted the plans of the borough surveyor, Mr. J. F. Smillie, for an isolation hospital, estimated to cost £30,000, and a sanatorium, estimated to cost £2,700.

Yarmouth T.C.—In an amendment of the plans for the public baths, it has been agreed that the shelters on the south, south and west sides should be supported on granite columns, and that the baths should be built in concrete, waterproofed with asphalt, and lined with glazed tiles. The borough surveyor, Mr. J. W. Cockrill, estimated the extra work in connection with the construction of walls and shelters would increase his original estimate of £3,500 by the amount of £640, making a total of £4,140, to which £2,400 would approximately be expended in labour.

HOUSING AND TOWN PLANNING.

Belfast T.C.—It was reported at the council meeting recently that the Local Government Board had given their sanction to the loan for the erection of working-class lodging-houses, the repayment to be spread over a period of sixty years.

Dungannon R.D.C.—Steps are being taken to promote a housing scheme, and the services of Mr. C. Newell have been retained as architect.

Essex C.C.—The Highways Committee were recently authorised to erect up to fifteen pairs of cottages for roadmen, under such provisional arrangements as should ensure the rents being sufficient to meet the instalments of principal and interest on loans and other outgoings. It was thought that loans at a comparatively low rate of interest might be obtained from Government funds, and the county architect estimated the cost of the cottages would be £304 or £354 a pair. Replying to a member, Councillor Dent said that, as at present advised, they could only borrow for thirty years, and at that period he was afraid they could not build on an economic basis. This report was only preliminary.

Shoreditch B.C.—The question of a housing scheme has been referred to the Housing Committee.

PARKS AND OPEN SPACES.

Barrow T.C.—The Local Government Board have sanctioned the purchase of Cellfachan Farm for the purpose of public pleasure grounds. The price was £2,300.

Leek U.D.C.—The council have approved an estimate (£3,660) of the surveyor, Mr. W. E. Beacham, of the cost of laying out Brough Park in accordance with plans already approved by the council, including the provision of a bandstand, pavilion shelter and bowling green.

ROADS AND MATERIALS.

Beckenham U.D.C.—It has been resolved to carry out a number of road improvements at a total estimated cost of £2,120, and to apply for grants in aid of the work from the Road Board and the Local Government Board.

Bethnal Green B.C.—Paving works are to be carried out in Hackney-road and Grove-road, at an estimated cost of £5,567.

Bolton T.C.—The following schemes of improvement have been agreed to: Hulton-lane, £9,966; Plodder-lane, £12,443; and Church-road, Smithills, £6,100.

Bootle (Cumberland) R.D.C.—The surveyor, Mr. D. R. Dawson, has submitted the plans and estimates for improvements to the main road which passes through the district. Altogether, over 11 miles of main road are to be altered, corners removed, and the whole macadamised, the estimated cost being £10,895.

Bradford T.C.—The Street, Drainage, and Works Committee propose to repave part of Thornton-road with granite setts, at an estimated cost of £2,475.

Bromley T.C.—It is announced that the Road Board have sanctioned a grant of £2,640 for wood paving.

Chapel-en-le-Frith R.D.C.—The question is under consideration of constructing a new road from Bugsworth to Bridgemont.

Coventry T.C.—A new road is to be constructed across Gosford Green, from Folly-lane to Binley-road.

Crieff T.C.—It has been agreed to carry out tar-painting at an estimated cost of £608.

Croydon T.C.—It has been decided to proceed as soon as possible with the construction of the relief road from Thornton Heath to Purley. The work will

be done by direct labour, and the estimated cost is £75,943.

Elgin C.C.—A decision has been reached to proceed with the scheme of improvement on the Dulnain Bridge, Grantown, and Dava-road, at an estimated cost of £1,900.

Essex C.C.—The Highways Committee have been authorised to carry out the following works: Epping New-road, Woodford Urban District Council boundary to the Robin Hood public-house, £8,000, and Rolls Hood to the Wake Arms, £9,300, these two schemes providing work for 300 men for four months; Barking to Grays road widening, £1,600, thirty men for four months; Sockett Heath widening, Little Thurrock, £1,000, twenty men for three months; Painter's-hill, Vange new road, £1,500, thirty men for three months.

Falmouth T.C.—The borough surveyor, Mr. J. S. Walton, has received instructions to prepare plans of a widening in Prince-street.

Hitchin R.D.C.—A scheme for widening Dunham's lane is to be carried out, at an estimated cost of £382.

Lewisham B.C.—The Road Board have provisionally approved the schemes of road improvement submitted by the borough surveyor, Mr. E. van Putten, and have been informed, in reply to their request, that the most urgent of the works were the wood paving at the Lee Green end of Eltham-road, the Burnt Ash-lane improvement, and the wood paving at the Lewisham end of Brownhill-road.

Limerick T.C.—A scheme has been adopted for asphalt and other paving works estimated to cost £40,000.

Lowestoft T.C.—The Road Board have given their sanction to the council proceeding with the scheme of road improvement already approved by the council, and have consented to make a grant to cover the amount of interest payable on the loan required. The Local Government Board have sanctioned the borrowing by the council of the sum of £10,900 for resurfacing roads, repayable in five years, and £2,200 for kerbing and channelling, repayable in fifteen years.

Mytholmroyd U.D.C.—Schemes of road widening estimated to cost £2,416, have been approved by the council.

Pickering R.D.C.—The surveyor, Mr. S. Russell, has obtained the consent of the council to the hiring of another steam roller in order to expedite the work of putting on the roads 1,000 tons of material.

Ramsgate T.C.—It has been agreed to carry out the widening of Shah-place and Ellington Park-road, at an estimated cost of £526.

Riccall R.D.C.—The road surveyor, Mr. A. Douglas, has received instructions to prepare an estimate for the Road Board of road improvements near Selby on roads which are likely to be subject to heavy traffic in connection with camp and training areas.

South Shields T.C.—A scheme of diversion is to be carried out in Team-lane-road, at an estimated cost of £8,970.

Southwark B.C.—With a view to providing work for the unemployed, the borough engineer, Mr. Arthur Harrison, approached the Road Board with a proposal that, in the event of the board agreeing to pay the cost of asphalting certain roads set out in the scheme, amounting to £11,579, the borough council would be prepared to carry out the asphalting of additional streets at a cost of £7,721, thus putting in hand works of a productive character to the extent of £19,301. The Road Board have now written intimating that they are prepared to agree to the proposal submitted to them, and the borough engineer has received the thanks of the council for his efforts.

Tynemouth T.C.—Among the schemes projected are the making of a road between the north end of Preston North-road and Mast-lane, Cullercoats, and the widening and diversion of the Blyth and Shields road between Holy Saviour's Church, Tynemouth, and Mast-lane. The two latter schemes are estimated to cost £6,000 and £7,000 respectively.

Whickham U.D.C.—It is proposed to carry out road improvements at an estimated cost of £1,000.

Yarmouth T.C.—The borough surveyor, Mr. J. W. Cockrill, has reported to the council that, owing to the war, there were certain road materials which could not be obtained, consequently the road-making programme for the year could not be carried out.

SEWERAGE AND SEWAGE DISPOSAL.

Banbury T.C.—The tender of Messrs. T. Vale & Sons, of Stourport, at £16,061, has been accepted for the sewerage and sewage disposal scheme.

Beeston U.D.C.—An order has been placed with Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, to supply one of their patent "Simplex" rotary sprinklers, 98 ft. diameter.

Burton T.C.—It is proposed to carry out sewerage extensions at an estimated cost of £1,620.

Colwyn Bay U.D.C.—The council have adopted the scheme of sewerage and sewage disposal for Mochdre prepared by Mr. Robert Green, M.INST.C.E. (Birmingham), which provides for the pumping of the sewage and its discharge into the sea. The scheme has been submitted to the Local Government Board, with an application for permission to borrow £11,000 to meet the cost.

Coventry T.C.—The council are recommended by the General Works Committee to carry out sewerage works at Stoke Park, at an estimated cost of £1,534. An expenditure of £1,200 is also advised in connection with the sewage disposal works.

Helston R.D.C.—It has been decided to construct a septic tank at Ruan Minor in connection with the drainage of certain parts of the village.

Kidderminster T.C.—At a meeting last week the scheme of sewerage and sewage disposal for districts recently added to the borough, prepared by Messrs. Willcox & Raikes, was duly approved, and it was decided to make an application at once to the Local Government Board for sanction to a loan of £31,000 for the works, which include sewering certain portions of the district, pumping plant, storm-water and sedimentation tanks, and laying out a considerable area of land as a sewage farm. It is intended to proceed with the works without delay.

Manchester T.C.—The Rivers Committee have under consideration proposals for undertaking certain main drainage works, so as to relieve or prevent unemployment in the city during the winter months. The committee have a number of men well skilled in drainage works whose employment is about to cease, and they wish to retain their services. They have, therefore, appealed to the Finance Committee to consider the matter, and report to the city council as to its financial aspect. The proposed works are needed, but they would not in ordinary circumstances have been undertaken just now.

Oxford T.C.—Owing to complaints by the Thames Conservators, the council have under consideration the question of improvements at the Chipping Norton sewage disposal works. The conservators insist upon the work being carried out immediately, and the council have appealed to the Local Government Board for a postponement.

Penybont R.D.C.—The council have decided to proceed with the Pencoed sewerage and sewage disposal scheme which was prepared by Mr. T. J. Moss-Flower, of Westminster and Bristol. The Local Government Board have approved of the scheme, and tenders are to be invited immediately. The proposed works include the construction of about 5 miles of sewers, with railway and stream crossings, detritus, balancing, sedimentation, humus, storm, and other tanks, percolating filters, sludge and filter beds, engine-house, engines, pumps, pump well, and other contingent works.

Rugby R.D.C.—The council have approved of schemes of sewage disposal for the villages of Clifton and Vicarage Hill. With respect to Newbold-on-Avon the surveyor, Mr. T. W. Willard, has submitted a modified scheme dealing with the upper part of the village by gravitation, at an estimated cost of £2,000, and this has been referred to the parish council.

Wakefield T.C.—The council have agreed to receive the sewage of a certain part of Stanley urban area on payment of 1s. in the £ annually on the assessable value of the property so served.

Welwyn R.D.C.—Subject to the water mains being laid with 3 ft. cover instead of 2ft. 6 in., the Local Government Board have sanctioned an outlay of £200 upon works of sewerage and water mains.

WATER, GAS, AND ELECTRICITY.

Barrow T.C.—Tenders aggregating £11,000 have been accepted in connection with the new gasworks.

Bradford T.C.—[illegible] are [illegible] by the [illegible] and transformed [illegible] at an estimated cost of [illegible].

Cheadle R.D.C.—The council have instructed Messrs. William [illegible] to prepare a scheme of water supply for various districts in the parishes of Caverswall, Consall, and Cheddleton. The water will be obtained from springs at Wall Myres, and pumped to [illegible] distance. Special arrangements are to be made for the supply of the County Mental Hospital, where there are some 700 patients.

Doncaster R.D.C.—The council have accepted the tender of Mr. Charles Fletcher, at £194, for laying [illegible] and the tender of Messrs. Newton Chambers & Co., of Sheffield, at £528, for erecting a tank capable of storing [illegible] gallons.

Forfar T.C.—It has been agreed to provide vertical retorts at the gasworks, at an estimated cost of about £10,000.

Okehampton T.C.—The borough surveyor, Mr. F. J. Warder, has received instructions to report on the best means of supplying a storage reservoir for improving the water supply and increasing the area of the [illegible].

Paignton U.D.C.—Tenders are being obtained for water main extensions in Marldon-road and Preston Sands-road.

Perth T.C.—The report in connection with the water supply has now been received. An inquiry has been in the hands of a Special Committee, and the engineers appointed by them for a period extending to about fifteen months, and recently the committee, accompanied by the engineers, made an extensive tour in England with a view to getting information and bringing forward what they thought would be a satisfactory solution to the water and sewage problem. It is understood that in the report the engineers favour what is known as the Bertha scheme, which, it was originally stated, would cost at least £125,000 to carry out. The proposal is that ground should be acquired on the policies of Bertha, on the north bank of the river Almond, about where that river enters the Tay, for the purpose of creating a large pond, into which should be stored the waters of the Tay, which would be allowed to settle prior to being pumped into the city. The proposal also hinted at the desirability of removing the existing pumping station from the foot of Marshall-place to the vicinity of Bertha.

Withernsea U.D.C.—The council on Monday sealed an agreement for the public supply of water for all purposes from the Hull Corporation in perpetuity. The price is fixed on a sliding scale, commencing at 1s. 3d. per 1,000 gallons for a minimum 55,000 gallons per day, after the first six months, during which the council pays for the actual consumption, reducing to 10½d. for a minimum of 200,000 gallons.

MISCELLANEOUS.

Devonport T.C.—The Surveyor's Committee recommend the council to acquire the freehold of land in the vicinity of the corporation storeyard, at the price of £7,500.

Manchester T.C.—The city surveyor, Mr. T. de Courcy Meade, has been instructed by the Parks Committee to consider and report as to the cost of constructing a light electric railway round Heaton Park, such report to indicate what portion of the cost would be represented by labour which could be accomplished by the unemployed.

PERSONAL.

Mr. Gwilym Williams has been appointed assistant surveyor to the Swansea Rural District Council.

Mr. H. C. Low, of Wimborne, has been appointed a temporary assistant in the surveyor's department, Harrow.

Mr. W. W. Walker, of Sheffield, has been appointed surveyor and inspector of nuisances to the Alford Urban District Council, at a salary of £78 per annum.

Mr. H. Percy Boulnois, M.Inst.C.E., the well-known municipal engineer, has been elected an honorary member of the Quantity Surveyors' Association. We congratulate Mr. Boulnois on having received this unsolicited honour.

Mr. Stanley Easter, pupil of Mr. F. L. Burch, engineer and surveyor to the East Dereham Urban District Council, has been appointed surveyor, being second to the East Molesey Urban District Council, at a salary of £80 per annum.

Mr. Richard F. Braithwaite, surveyor to the Selby Rural District Council, was married on the 22nd inst. to Miss Florence M. Fair, daughter of Mr. Henry Fair, J.P., of Manchester, at Wistow Bar Parish Church. Mr. J. Townend, clerk to the Selby Rural District Council, was best man.

Mr. D. H. Steward, district surveyor to the Norfolk County Council, has been appointed assistant to the county surveyor of Pembrokeshire, Mr. T. George, and will take up his duties about the middle of next month. The vacancy under the Norfolk County Council has been filled by the appointment of Mr. G. E. Mullard, surveyor of the Eastern District of the Docking (Norfolk) Rural District Council.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive applications for the appointment of two thoroughly competent Road Foremen in the City Surveyor's Department. Wages, 40s. per week rising by annual increments of 2s. 6d. per week to 45s. Candidates must be fully qualified persons, who have had recent practical experience in the construction, maintenance and scavenging of the various classes of roads and streets of a large town; also in the management of large bodies of workmen. They must be able to keep clearly their notebooks, set out works from plans, measure up works in course of construction, and prepare estimates.

The candidates appointed will be required to devote the whole of their time to the service of the Corporation, and also to contribute to the Superannuation Scheme, for which purpose they must submit themselves to the Corporation Doctor for examination. The appointments will be subject to the Doctor's report being satisfactory. Applications, in candidate's own handwriting, stating age (which should not exceed 40), experience, past and present employment, accompanied by copies of not more than three recent testimonials, and endorsed "Road Foreman," to be sent to the undersigned not later than Monday, 16th November, 1914.

Canvassing, either directly or indirectly, will be a disqualification.

HENRY E. STILGOE, M.Inst.C.E.,
City Engineer and Surveyor.

Council House, Birmingham.
October 28, 1914. (2,048)

ASSISTANT ENGINEER required for the Lagos Municipal Board of Health, Nigeria, for a period of eight to twelve months, with possible extension. Age 25-40. Salary £300. Free quarters and first-class passages. Liberal leave in England on full salary. Candidates possessing an all-round knowledge of the duties of a Municipal Engineer's Office and experienced in the valuation of property should apply at once by letter to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (2,051)

REQUIRED at once one Senior Private Street Works Assistant. Salary £2 15s. per week; also two Junior Private Street Works Assistants. Salary £2 5s. per week. Temporary engagement until termination of the War, or at least for twelve months. Apply, with full particulars of experience and copies of testimonials, to Box 1,479, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,050)

ENGINEERING ASSISTANT (23), three years' articles in City Engineer's Office, desires appointment in municipal office. Competent surveyor, leveller, Stud.Inst.C.E.—Box 1,478, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,049)

Standard of a Habitable House in Town and Country.*

By A. B. DUNNE, L.A., M.B., Medical Officer of Health, Doncaster Rural District Council and Bentley Urban District Council.

I propose to limit my paper to a consideration of the standard appropriate to houses inhabited by what may be broadly termed the working classes. The question of a standard for new houses, both in town and country, presents no essential difference, although subject to modification by locality, type of workmen to be housed, rate of wages, &c. Another point, and in my opinion a very important one, is what standard should be applicable to existing houses? This raises issues in which "the personal equation" of the individual medical officer of health must of necessity play an important part, and still more so that of the local authority.

Let us first of all direct our attention to the standard which is required for a house to be occupied by the regularly employed artisan or collier. For the less fortunate workman in the towns and the agricultural labourer a cheaper class of house is required, simpler and more restricted in its conveniences.

I have recently been interested in a scheme for housing the working classes initiated by the urban district council of Bentley, which may be regarded as a typical modern mining community. A type of house is designed to let at 7s. per week clear. A description of this class of house, designed by the council's surveyor, Mr. R. G. Whiteley, for the accommodation of artisans and colliers, well illustrates the standard of an urban working man's dwelling.

The ground plan shows living-room, scullery, food-store, coal-place, and closet; on the first floor there are three bedrooms. There are no out-buildings or projections from the main buildings, all are under one roof. The living-room is 15 ft. by 12 ft. 6 in. clear, and scullery 11 ft. 6 in. by 9 ft. 6 in., with copper, sink, and bath provided. Access to the water-closet and the coal-place is from the recessed porch of the back entrance. There is a recessed porch to the front door. A food-store 6 ft. by 2 ft. 7½ in., which ventilates directly into this porch, is provided alongside the living-room. A staircase 2 ft. 9 in. wide leads directly out of the living-room, and is placed over the coal-store and closet. The first floor contains three bedrooms, as follows: No. 1, 12 ft. 6 in. by 10 ft. 3 in.; No. 2, 11 ft. 6 in. by 9 ft. 6 in.; No. 3, 9 ft. 6 in. by 7 ft. 6 in. All the bedrooms can be entered directly from the landing, and are provided with fire-places, with the exception of No. 3. The frontage of such a house is 18 ft. 9 in., and the depth 23 ft. 10½ in., and are intended to be erected in blocks of six or eight. It will be noticed that no "hall" or "parlour" is provided.

Such, then, is a standard house for, if one may so call him, a standard workman with a standard family.

A few general observations are necessary.

I take it that any dwelling intended for permanent occupation must be built of bricks and mortar, the common currency of the building trade, as one may term them. So far as I am aware, no cheaper form of material has successfully established its claim to supplant them.

SITE OF DWELLINGS.

Much of the present deplorable state of the housing which now exists is due to the fact that any place was thought good enough to build a house upon, and to a certain extent the same is true to-day. Therefore one of the most useful provisions in any town planning scheme is that which enables the local authorities to determine what parts of an area are to be allotted to dwelling-houses, factory sites, &c. Much low-lying and otherwise unsuitable land for building houses upon will thus be ruled out. Now that the value of direct sunlight is becoming more appreciated, there is additional reason that the living-room should have a south-east or south-west aspect.

The minimum accommodation required resolves itself into the question of individual requirements and wages. But apart from this, what should guide an authority in designing a house? Having visited many workmen's homes, I am of opinion that a large sunny living-room, at least 14 ft. by 12 ft., is a *sine qua non*, and my opinion has been confirmed by answers I have received from housewives whom I have questioned.

It has been argued that another room or parlour should be provided; that the husband or young couple must be thought of. My answer is that the claims of the housewife come before the husband, and that the young couple will look after themselves. What use is a parlour in most cases? I have more often than not found it unfurnished, or used to store the bicycle or pram in; sometimes let off to another family, or used as a bedroom for a lodger. The choice lies between a large, cheery living-room, with plenty of elbow room, and a cramped living-room and a pokey parlour.

Is a "hall" required? No. This cannot be without sacrifice of valuable space, which can be better utilised in the general living-room than being wasted by being cut off as a dark, narrow passage, which leads to a front door seldom, if ever, used.

Of what material should the floor of the living-room be? Much may be said for a board floor, but this presumes sound, seasoned wood, and good, honest workmanship. A board floor is hard to keep clean, often harbours filth, and is much more difficult to scrub than a tiled one. I am myself in favour of tiles or "quarries" set in cement. Few will deny that one's own kitchen thus floored is among the cleanest and most comfortable of rooms. Ask a woman of experience which is the easiest to keep clean, and she will say a tiled floor. This floor is dry, clean and durable.

A good closed range is both economical in cooking and cleanly, and has this advantage over an open or Yorkshire range, that more than one pan at a time can be used for cooking.

An essential to a living-room is the provision of one or more large cupboards.

A good scullery is the next essential. I have presumed that water is laid on over a glazed earthenware sink provided with a large hardwood drainage board. A copper should be provided fitted with a galvanised iron cover, so arranged as to permit the steam to escape up the flue. Lastly, a bath should be provided with hot and cold water laid on, and should have a hinged lid to cover it when not in use. Much amusement has from time to time been aroused by tales concerning the uses to which the bath has been put. I have made it a point to examine as many baths as I could, and have not up to now found any rabbits or boxes of bedding-out plants kept in them. I think too much has been made of the misdeeds of tenants.

Is a water-closet an essential? In a house such as I am describing, erected in a locality where there is a public water supply and a sewage disposal system, a pedestal water-closet is an essential. Between the water-carriage system and any other, at all events as regards urban communities, "the verdict of the stricken field has been given," to use a picturesque phrase of Lord Salisbury. The water-closet is placed in a closet which is isolated from the house by the rear recessed porch; this arrangement allows of a greater degree of privacy, and permits of a backyard unobstructed by outbuildings, an important matter when the washing is done at home and the clothes have to be hung out to dry in the backyard.

THE FOOD-STORE OR PANTRY.

This very essential provision has hardly received the attention which it deserves. The food-store in the past has been an afterthought, but I have noticed in the new colliery village houses that very satisfactory ones are provided; in fact, more so than in my own house, which is of the under-stairs type.

The ideal food-store is on the ground floor, with one wall an outside one at least. It need not necessarily be large, as food is not bought and stored in large quantities nowadays; but it should be cool and

* Paper presented at the annual congress of the Royal Sanitary Institute at Blackpool.

[illegible]

BEDROOMS

[illegible] be provided. In fact, the question of bedroom accommodation ranks along with the living-room as the two important questions in housing. As the [illegible] bed. The largest room will usually be occupied by husband and wife, and should in addition be able to [illegible] 12 ft. 6 in. by 10 ft. 6 in. by 8 ft. will do this comfortably.

The bedroom window should not be less than one-tenth the floor space; this, in my opinion, can with advantage be increased. Let me put in a plea for the sash window, as enabling the room to be more [illegible] type. The latter, with their cheap fittings, soon get broken and out of order, and then the window is seldom opened.

The third bedroom should easily accommodate a single bed, but as single beds are but rarely used by the working classes, it were better that this room should be designed for the use of a double bed. All bedrooms should have a fireplace, but in the type of house we are considering it is usually impracticable to provide fireplaces in all three bedrooms. A ventilating opening must be placed in the outside wall.

THE BACKYARD.

Experience leads me strongly to urge the asphalting of the whole of this. In theory, to reserve some part of it for flower-beds is all very well, but in practice all uncovered earth soon becomes trodden down, and then soaked and soddened with tea-leaves, scraps of broken food, potato peelings, &c. Therefore an asphalted backyard is an essential, as thereby alone can it be kept clean and sanitary.

Finally, sanitary dustbins should be provided. The ones which are supplied are too small in most cases to contain the week's household refuse. Unfortunately, these tins soon get knocked about and worn out and the lids lost, though fastening them by a chain to the house wall will obviate this. A backyard common to a block of houses should not be countenanced. It is a fruitful cause of untidiness, and what is everybody's business to keep tidy is nobody's. The rule should be every house its own backyard.

When we consider the standard of a habitable house for the poorly-paid worker in the town and the agricultural labourer, we are at once faced with the difficulty that the average weekly income of the former may never reach 25s., and in the latter rarely 18s. or 20s.

What rent can these afford to pay, keeping in mind the expense of rearing a family and the enhanced cost of living? I certainly think that 4s. and 3s. a week are the utmost that can be asked. Can houses be built to let within these rentals, and of what materials, on what land, of what size, and with what maximum room accommodation? It has been suggested that the £100 cottage will solve the difficulty in the agricultural districts. Will it? I have my doubts, which have been confirmed by the account that I have read by Dr. R. W. C. Pierce in his annual report for 1913 to the Guildford Rural District Council on the cottages built by Mr. St. Loe-Strachey.

The labourer is worthy of his home, which must be soundly built of durable materials, plain in character, and necessarily shorn of some of the conveniences and amenities found in the urban workman's home—to mention one in particular, a bath. At the Church Congress at Southampton last year Lord Salisbury said that the agricultural labourer did not want one; his lordship's statement was warmly traversed. There are conveniences now lacking in many rural cottages which might well take precedence of a bath. How about a copper? It does duty for both purposes in thousands of homes. I should certainly prefer a copper to a bath any day, and the cottage housewife has my sincerest sympathies when she has to boil the weekly wash in the pot over the open kitchen fire.

As water will rarely be laid on, a well-designed privy should take the place of a water-closet, even for houses under the rank of the country mansion. An experience of country rectories in several dioceses has led me to entertain the opinion that there is much to be said for the advantages of the earth-[illegible] over the water-closet.

Finally, as my paper would run into several appendices, I must conclude with a few words on the standard of habitability of existing houses. What principles should guide one in arriving at the conclusion that "a dwelling-house appears to be in a state so dangerous or injurious to health as to be unfit for human habitation"? Local authorities are apt to take a different view from their professional and statutory advisers as to the grounds on which the representations are based. Briefly, I would enumerate such conditions, either existing alone in such a marked degree or in conjunction with others, as would support such a representation:

(1) Dampness in living-rooms of old houses, due either to walls built without dampcourses, or of very hygroscopic materials, such dampness rising up the walls to a considerable height, or extending over a large area, and persisting even in dry weather.

(2) No through or sufficient ventilation. Among such dwellings I would include those houses which are built "back to earth," where the adjacent earth reaches a high level, and back-to-back houses, so common in the Northern towns.

(3) General dilapidations, under which I include cottages with walls perished, roofs leaky, rafters rotten, bedroom floors sprung and unsafe, and broken tiles laid on earth.

(4) The hopeless cases—for instance, dwellings which have been improvised out of old malt-kilns, barns, cart-sheds, and other miscellaneous buildings.

PRESENTATION TO MR. E. G. MAWBEY.

Mr. E. George Mawbey, M.Inst.C.E., was on Friday evening last presented by his staff with an illuminated address, as an expression of their respect and esteem and of congratulation on the completion of twenty-five years' service as borough surveyor of Leicester.

Mr. Willis Wigg, Assoc.M.Inst.C.E., who occupied the chair, spoke of the sterling qualities of Mr. Mawbey, both as an engineer and as a chief, in respect of his relations with his staff, who were always treated with the greatest consideration and kindness, and who had benefited largely by the example set before them by the borough surveyor. On behalf of the staff he wished Mr. Mawbey many years of happiness and prosperity, and expressed the hope that he might long continue to occupy his present position. Mr. Wigg read a letter of deep appreciation of Mr. Mawbey's qualities from Mr. Charles F. Lythall, who was unavoidably prevented by indisposition from being present. In this the writer called attention to the large number of previous members of the staff who were now holding positions as city and borough surveyors in other towns, this being, in no small measure, due to Mr. Mawbey's readiness always to help.

Mr. J. Edwin Roper, L.R.I.B.A., the senior assistant of the town hall staff, after a few appreciative remarks, then read and presented the framed address.

Mr. Mawbey, who was received with loud applause, expressed his great surprise and unqualified pleasure at being made a recipient of so handsome a tribute, and emphasised the loyal service he had received from his staff throughout the whole of the twenty-five years. He said that it was the proudest moment of his life, and he could not express how deeply he felt this spontaneous expression of the generous feeling of his staff towards him. He spoke in the highest terms of the splendid services his staff had rendered in the town, and the very valuable and efficient assistance they had at all times given to him in all the great works and routine duties for which his department had been responsible.

Surveyors' Institution Junior Meetings. — The president of the Surveyors' Institution has awarded to Mr. Bernard Gasson, of Child's Hill, London, N.W., the prize for the best paper submitted for reading during the coming session. Mr. Gasson's paper, which is entitled "Some Elements of Specification Writing," will be presented at the meeting to be held at the institution on Monday, November 16th.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Horace Boot, M.I.E.E., M.I.Mech.E.

EASTERN AND NORTH-EASTERN DISTRICTS.

An Eastern and North-Eastern District meeting (the programme of which appeared in last week's Surveyor) will be held at Lincoln to-morrow (Saturday).

B. Wyane,
39 Victoria-street, S.W. *Secretary*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY ASSISTANT.—October 31st.—Walton-upon-Thames Urban District Council. £2 2s. per week.—Mr. R. Wilds, surveyor.

INSPECTORS.—October 31st.—Rhymney Valley Sewerage Board. £2 10s. to £3 per week.—Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, S.W.; or Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

TEMPORARY ASSISTANT.—October 31st.—Somerset County Council. £3 3s. per week.—Mr. Edward Stead, county surveyor, Wells, Somerset.

TEMPORARY ASSISTANT ROAD SURVEYOR.—October 31st.—Gloucestershire County Council.—County Surveyor, Shire Hall, Gloucester.

JUNIOR CLERK.—October 31st.—The Maldens and Coombe Urban District Council. £1 per week.—Mr. R. H. Jeffes, engineer and surveyor, Council Offices, New Malden.

INSPECTOR OF NUISANCES.—October 31st.—Cowbridge Rural District Council. £90 per annum.—Mr. J. Stockwood, clerk, Cowbridge, Glamorgan.

CLERK OF WORKS.—October 31st.—Pembroke (co. Dublin) Urban District Council. £3 3s. per week.—Mr. J. C. Manly, clerk, Town Hall, Ballsbridge.

ASSISTANT.—November 2nd.—Atherstone Rural District Council. £100 per annum.—Mr. H. J. Coleby, engineer and surveyor, 102 Long-street, Atherstone.

ASSISTANT SURVEYOR.—November 2nd.—West Riding Highways Committee. £150 per annum.—Mr. F. G. Carpenter, West Riding surveyor, County Hall, Wakefield.

INSPECTOR OF NUISANCES.—November 3rd.—Shanklin Urban District Council. £90 per annum.—Mr. J. Marsh, clerk.

ASSISTANT ENGINEER AND SURVEYOR.—November 3rd.—Chelmsford Rural District Council. £80—£120 per annum.—Mr. Arthur S. Duffield, clerk, 96 High-street, Chelmsford.

ENGINEERING ASSISTANT.—November 4th.—Corporation of Wakefield. £120.—Mr. C. C. Smith, Town Hall, Wakefield.

INSPECTOR OF NUISANCES.—November 5th.—Llanidloes Town Council. £75 per annum.—Mr. A Davies, town clerk.

DISTRICT ROAD SURVEYOR.—November 7th.—West District Committee of the Ross and Cromarty County Council. £150, with £30 for travelling expenses.—Mr. D. Mackenzie, district clerk, Torridon, Ross-shire.

TOWN PLANNING ASSISTANT.—November 7th.—Mexborough Urban District Council. £150 per annum.—Mr. G. Fenwick Carter, surveyor, Council Offices, Mexborough, near Rotherham.

JUNIOR ASSISTANT.—November 9th.—Foots Cray Urban District Council. £70—£90 per annum.—Mr. W. Augustus Farnham, engineer and surveyor, Council Offices, Sidcup, Kent.

SEWAGE WORKS MANAGER.—November 10th.—Corporation of Dewsbury. £400 per annum.—Mr. H. Ellis, town clerk.

ENGINEERING ASSISTANTS.—November 12th.—Corporation of Birmingham. £130—£150.—Mr. Henry E. Stilgoe, city engineer and surveyor.

BOROUGH SURVEYOR AND INSPECTOR.—November 14th.—Corporation of Monmouth. £130 per annum.—Mr. Bickerton H. Deakin, town clerk.

ASSISTANT.—Corporation of Birkenhead. £2 10s. per week.—Borough Engineer and Surveyor, Town Hall.

ENGINEERING AND SURVEYING ASSISTANT.—Irlam Urban District Council.—Mr. R. H. Winterbottom, surveyor.

SURVEYING ASSISTANT.—Staffordshire County Council. £90 per annum. County Surveyor, Stafford.

MUNICIPAL COMPETITIONS OPEN.

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SOUTHEND.—December 4th.—Schemes for a tuberculosis hospital, for the corporation. Premiums £100, £50, and £25.—Mr. E. J. Elford, borough engineer.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

RUGBY.—November 2nd.—For the erection of a disinfecting chamber, for the urban district council.—Mr. J. H. Sharp, surveyor.

GREENWICH.—November 2nd.—For the erection of a dispensary, for the borough council.—Mr. A. Roberts, architect, 92 London-street, Greenwich.

HERTS.—November 2nd.—For demolition of existing bridge and building a new bridge, for the county council.—County Surveyor, Hatfield.

RATHMINES.—November 2nd.—For the construction of new cells in connection with the dust destructor, for the urban district council.—Mr. F. P. Fawcett, clerk.

PRESTON.—November 3rd.—For the erection of a cottage, for the Joint Hospital District.—Mr. W. D. T. Munford, architect, 12 Guildhall-street, Preston.

WANDSWORTH.—November 3rd.—For the construction of underground conveniences, for the borough council.—Borough Engineer, 215 Balham High-road, S.W.

MANSFIELD.—November 3rd.—For the erection of three hospital pavilions, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

EAST STOW.—November 4th.—For the erection of working-class dwellings, for the rural district council.—Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

COLWYN BAY.—November 4th.—For the construction of a sliding table and lift for lowering and raising railway wagons, for the urban district council.—Mr. J. Smith, Gas Offices, Colwyn Bay.

HALIFAX.—November 4th.—For the erection of a warehouse and shop, for the corporation.—Mr. J. Lord, borough engineer.

BURNTISLAND.—November 5th.—For alteration of buildings to provide three dwellings, for the town council.—Mr. J. A. Waddell, burgh surveyor.

MACCLESFIELD.—November 6th.—For the adaptation of school premises for a clinic and feeding centre, for the Education Committee.—Mr. W. Grieves, secretary, Town Hall.

LONDON.—November 6th.—For the construction of two service reservoirs, for the Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

CORNWALL.—November 7th.—For additions to certain schools, for the Education Committee.—Mr. S. Hill, architect, Green-lane, Redruth.

OSWESTRY.—November 9th.—For laying mains, sluice valves, and fire hydrants at waterworks, for the rural district council.—Messrs. Berrington, Son & Watney, Prudential Chambers, Wolverhampton, and 22 Victoria-street, Westminster.

CROYDON.—November 10th.—For supplying iron [illegible] the corporation.—Borough Engineer.

LANCASHIRE.—November 10th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

BARNET.—November 10th.—For the erection of thirty-two cottages and a block of flats, for the urban district council.—The Surveyor.

UXBRIDGE.—November 10th.—For the erection of twenty-eight dwellings, for the urban district council. —Mr. W. L. Eves, surveyor, 54 High-street.

BARNET.—November 11th.—For the erection of twenty-four cottages, for the rural district council.—Mr. A. J. Wilshire, surveyor.

WELLS (Norfolk).—November 14th.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. H. Kennard, architect, 26 Great James-street, Bedford-row, London, W.C.

BARNET.—November 17th.—For the erection of council offices and an underground convenience, for the urban district council.—Mr. W. B. Chancellor, [illegible]

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

OSWESTRY.—November 9th.—For laying cast-iron mains, sluice valves, fire hydrants, and air valves, for the rural district council.—Messrs. Berrington, Son, & Watney, Prudential Chambers, Wolverhampton, and 28 Victoria-street, Westminster, S.W.

CROYDON.—November 10th.—For the supply of 830 tons of cast-iron pipes and specials, for the corporation.—Borough Engineer.

Roads.

SUNBURY-ON-THAMES. — November 2nd. — For road widening and reconstruction, for the urban district council.—Mr. H. F. Coales, engineer.

WHITLEY AND MONKSEATON.—November 2nd. —For works of public and private improvement, for the urban district council.—Mr. A. J. Rousell, surveyor, Whitley Bay.

ROTHWELL.—November 2nd.—For laying concrete foundations and paving with granite setts, for the urban district council.—Mr. J. Southwart, surveyor.

SOUTHALL-NORWOOD.—November 2nd.—For the supply of road materials, for the urban district council.—Mr. R. Brown, engineer and surveyor, Town Hall, Southall.

THE MALDENS AND COOMBE.—November 3rd.—For making-up work and paving with artificial slabs, for the urban district council.—Mr. R. H. Jeffes, Municipal Offices, New Malden.

LLANDAFF.—November 3rd.—For works of street improvement, for the rural district council.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

RATHDOWN.—November 3rd.—For making a new road, for the rural district council.—Mr. P. Cunniam, clerk, Loughlinstown.

CARSHALTON.—November 4th.—For the supply of granite, granite chippings, and hire of steam roller, for the urban district council.—Mr. W. Willis Gale, surveyor.

LARNE.—November 4th.—For work of road construction, for the rural district council.—Mr. T. Nelson, clerk.

CAMBRIDGESHIRE. — November 4th. — For the supply of broken granite, basalt, slag, and tarred macadam during the year ending March 31, 1916, for the county council.—The Clerk, County Hall, Cambridge.

GLASGOW.—November 5th.—For making up certain streets, for the corporation.—Office of Public Works, 64 Cochrane-street.

MANCHESTER.—November 6th.—For paving certain streets with granited rock asphalt, for the corporation.—Surveyor, Town Hall, West Didsbury.

BRIGHOUSE.—November 7th.—For paving work with granite setts on concrete, and other incidental work, for the corporation. — Mr. S. S. Haywood, borough engineer and surveyor.

POULTON-LE-FYLDE. — November 7th. — For making up a street, for the urban district council.—Mr. J. B. Moss, surveyor.

NORFOLK.—November 7th.—For the supply of granite for the year ending December 31, 1915, for the county council.—Mr. T. H. B. Heslop, county surveyor, The Shirehouse, Norwich.

WEST SUSSEX.—November 7th.—For the supply or hire of steam rollers, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

WEST SUSSEX.—November 7th.—For the supply of about 200,000 gallons of tar, for the county council.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

WEST SUSSEX.—November 7th.—For the supply of broken granite, quartzite, or other approved stone, chippings, tarred macadam, picked surface flints, pit flints, sand or binding material, cartage, and team labour, for the Roads and Bridges Committee.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

HAYWARDS HEATH.—November 9th.—For private street works, for the urban district council.—Mr. G. Plummer, engineer and surveyor.

KENILWORTH.—November 9th.—For the supply of broken granite and slag, for the urban district council.—Mr. S. Douglas, engineer and surveyor.

ISLINGTON.—November 10th.—For paving with granite setts and wood blocks, for the borough council. —Mr. J. Patten Barber, borough engineer.

CHIPPENHAM.—November 10th.—For the supply of granite macadam, chippings, tar-macadam, steam rolling, disinfectants, tar, Tarvia, and similar materials, for the corporation.—Mr. A. E. Adams, borough surveyor.

NEWMARKET.—November 12th.—For the supply of a steam roller with scarifier, for the urban district council.—Mr. William Henry Eley, engineer and surveyor.

READING.—November 12th.—For making up part of Albert-road, for the sanitary authority.—Mr. J. Bowen, borough engineer and surveyor.

HASTINGS.—November 14th.—For the supply of 1,000 yds. of unbroken blue stone, for the rural district council.—Mr. D. Paine, surveyor, Stonelynk Farm, Fairlight, Hastings.

EAST SUSSEX.—November 16th.—For the supply of materials, haulage, and team labour, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

LUTON.—November 16th.—For the supply of broken slag, for the year ending November 30, 1915, for the corporation.—Borough Engineer.

SOUTHAMPTON.—November 18th.—For the hire of steam rollers during the year ending March 31, 1916, for the county council.—County Surveyor, The Castle, Winchester.

SOUTHAMPTON.—November 18th.—For the supply and delivery of tools for use on main roads, for the county council.—County Surveyor, The Castle, Winchester.

SOUTHAMPTON.—November 18th.—For the supply of stone for the repair of the main roads, for the county council.—County Surveyor, The Castle, Winchester.

Sanitary.

AUCKLAND.—November 2nd.—For providing and laying down glazed earthenware pipe sewer and manholes, for the rural district council.—Mr. C. Heslop, sanitary surveyor.

RHYMNEY.—November 3rd.—For the construction of main outfall sewer, for the Sewerage Board. —Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

EALING.—November 3rd.—For the construction of a relief surface-water sewer and manholes, about 5,400 ft. of 24-in. armoured concrete tubes, for the corporation.—Mr. W. R. Hicks, borough engineer.

EPSOM.—November 3rd.—For the construction of concrete tube storm relief sewer and other works, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

BELFAST.—November 3rd.—For the construction of sewers and manholes, for the corporation.—City Surveyor.

RHYMNEY VALLEY.—November 3rd.—For the construction of main outfall sewer, for the Rhymney Valley Sewerage Board.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham, or Mr. T. J. Thomas, 63 High-street, Bargoed, Glam.

EAST STOW.—November 4th.—For the construction of a sewer and manholes, for the rural district council.—Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

EAST STOW.—November 4th.—For work of sewer extension, for the rural district council.—Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

HOLYWOOD (Dumfries).—November 5th.—For work of sewerage, for the urban district council.—Mr. D. Bell, clerk.

BURNHAM (Somerset).—November 7th.—For the construction of sewers, manholes, ejectors, power station, and other contingent works, for the urban district council.—Mr. W. H. Chowins, engineer, Public Offices, Burnham.

GLASGOW.—November 7th.—For the construction of a cast-iron pipe drain, for the corporation.—Mr. J. Lindsay, town clerk.

ROCHFORD.—November 9th.—For constructing about 3½ miles of glazed-stoneware and cast-iron pipe sewers, together with manholes and other works, for the rural district council.—Mr. A. C. Madge, surveyor.

EASINGTON.—November 10th.—For the construction of about 16,000 lin. yds. of stoneware and cast-iron pipe sewers, with manholes, flushing chambers, and other works connected therewith, for the rural district council.—Mr. G. Waterhouse, engineer.

LICHFIELD.—November 11th.—For laying sewer and manholes, for the rural district council.—Mr. C. O. Rawstron, surveyor.

ASHTON-UNDER-LYNE.—November 11th.—For the extension of the sewage disposal works, for the corporation.—Mr. J. Rowbottom, engineer, Town Hall.

ORSETT.—November 18th.—For the construction of sewers, and providing engines, compressors, ejectors, and other works, for the rural district council.—Messrs. H. Walker & Son, Albion Chambers, Kingstreet, Nottingham.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le President de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

BIRMINGHAM.—November 4th—9th.—For the supply of stores, for the Water Committee.—Foreman, Brasshouse-passage, Broad-street.

CHATHAM.—November 11th.—For the supply of gravel, sand, Portland cement, crushed ragstone, bricks, lime, clothing, sewer boots, stoneware drain pipes, gullies, sewer ironwork, timber, picks and shovels, for the corporation.—Borough Surveyor.

Miscellaneous.

TOTTENHAM.—November 3rd.—For the supply of a petrol motor ambulance, for the urban district council.—Mr. W. H. Prescott, engineer.

WESTMINSTER.—November 4th.—For the supply of motor tip wagons, to be used with interchangeable dust and water bodies, for the borough council.—Town Clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BEDLINGTON.—Accepted for the supply of 5,000 tons of hand-broken road whinstone, for the urban district council.—Mr. J. F. Johnston, surveyor:—

Park Appleby, Limited, Lesbury, Northumberland.
Ewesley Quarry Company, Limited, Newcastle-on-Tyne.

CHISWICK.—For making up a street, for the urban district council.—Mr. E. Willis, surveyor:—

G. Wimpey & Co., Hammersmith, W.	£985
T. Adams, Wood Green, N.	968
E. & E. Iles, Wimbledon	920
H. Farrow, Brixton	900
D. T. Jackson, Barking	895
Free & Sons, Maidenhead	880
A. T. Brummell, Willesden	808
M. N. Rhodes, Chessington, Surrey *	730

CHISWICK.—For the construction of a brick and concrete culvert, for the urban district council.—Mr. E. Willis, surveyor:—

T. Adams, Wood Green, N.	£427
G. Wimpey & Co., Hammersmith, W.	399
D. T. Jackson, Barking	360
T. W. Pedrette, Enfield	336
E. & E. Iles, Wimbledon	330
A. Roberts & Co., Limited, Earls Court-road, S.W.	290
Taylor & Hayley, Victoria-street, S.W.	285
A. T. Brummell, Willesden *	269

COSFORD.—For the construction of a brick tower, laying water mains, standpipes, valves, and other works, for the rural district council.—Mr. C. Dudley Bright, Polstead, Suffolk:—

Downs & Stephenson, Hadleigh	£660
B. B. & M. Barrell, Wivenhoe	572
A. Dunningham, Hadleigh *	547
M. J. Dummock, Bildeston	534

ERPINGHAM.—For making up a road, for the rural district council.—Mr. R. Mann, surveyor:—

Wilson	£365
R. J. May, Norwich	274
L. J. Edwards, Norwich	262

HAMMERSMITH.—For paving the carriageway of Dalling-road, for the borough council.—Mr. H. Mair, borough surveyor:—

Acme Flooring and Paving Company, Victoria Park, N.E.	£4,213
G. Wimpey & Co., Hammersmith, W.	4,194
J. Mowlem & Co., Westminster, S.W.	4,099
Improved Wood Pavement Company, Queen Victoria-street, E.C.	4,069
E. & E. Iles, Wimbledon, S.W.	4,010
Griffiths & Co., Bishopsgate, E.C.*	3,969

HAMMERSMITH.—For the erection of a urinal, for the borough council.—Mr. H. Mair, borough surveyor:—

C. P. Roberts, Dalston, N.E.	£398
Roberts & Co., Earls Court-road, S.W.	356
W. J. Dickens, Ealing, W.	334
G. W. Clark, Shepherd's Bush, W.	319
Hughes & Co., Limited, Mortlake, S.W.	311
W. Atkinson & Sons, Fulham, S.W.	299
H. & S. Jones, West Brompton, S.W.	258
H. & E. Lea, Brewer-street, W.*	257

IPSWICH.—For the erection of public health offices, for the corporation.—Mr. J. R. Mead, borough engineer and surveyor:—

A. Gayford, Ipswich, £7,270.

KIRKCALDY.—For the causewaying of Oriel-road with granite setts, for the town council.—Mr. J. L. Lumsden, burgh surveyor:—

A. H. Robertson, Inverkeithing	£746
W. Dobson, Edinburgh	563
R. J. Morrison, Kirkcaldy *	521

LEATHERHEAD.—For a supply of broken granite and steam rolling, for the urban district council.—Mr. S. R. Drake, surveyor:—

STEAM ROLLING, &c.	Per day s. d.
Eddison Steam Rolling Company, Dorchester	28 5
N. Merrett, Melksham	27 0
E. Parry & Co., Putney	25 9
McEwart & Co., Acton	24 6
T. Bowley, junr., Tottenham	22 0

2-IN. GUERNSEY GRANITE.	Per ton. s. d.
Brookes, Limited, London	16 3
Fry Brothers, Limited, London	16 0
Rowe & Mitchell, London	15 9
J. Mowlem & Co., London	15 6
W. Griffiths & Co., London	15 6
A. & F. Manuelle, London	15 2

BRITISH GRANITE	Per ton. s. d.
British Macadams, Limited, London	16 3
London Granite Company, Limited, London	16 0
Penlee and St. Ives Stone Quarries, Limited, Bristol	16 0
Croft Granite Brick and Concrete Company, Limited, Croft	14 7
Enderby and Stoney Stanton Granite Company, Leicester	14 5
Charnwood Granite Company, Loughborough	14 3
Ellis & Everard, Leicester	14 3
Mountsorrel Granite Company, Limited, Loughborough	13 9
Summerfield & Lang, Limited, Liverpool	13 6
Roadstone Supply Company, Shepton Mallet	12 9

4-in. by 4-in. Granite Setts.—A. & F. Manuelle, London, 36s. 6d. per ton.

PORTLAND.—Accepted for the construction of a public convenience, for the urban district council.—Mr. R. S. Henshaw, engineer and surveyor:—

Jesty & Baker, Portland, £88.

ROYSTON.—For alterations to sewers, manholes, and ventilators, and the construction of flushing tanks, for the urban district council.—Mr. T. W. Witts, surveyor:—

H. S. Wallis, Limited, Ipswich	£220
Jacklin & Co., Royston	182
W. H. Hinkins & Son, Royston	162

Surveyor's estimate, £172.

SHEFFIELD.—For the execution of works in connection with the covering of the river Sheaf, consisting of bridge widening, new weir, new bridge, retaining wall, and new street, for the corporation.—Mr. C. F. Wike, city engineer:—

Wellerman Brothers, Limited, Sheffield, £8,378.

SHREWSBURY.—For laying 530 lin. yds. of 12-in. pipe sewer and manholes, for the corporation.—Mr. A. W. Ward, borough surveyor:—

Emery & Co., Aston, Birmingham.

WATH-UPON-DEARNE.—For the alteration and reconstruction of the sewage disposal works, for the urban district council.—Mr. J. H. Drew, engineer:—

Ward & Tetley, Bradford	£15,833
H. & E. Andrews, Sheffield	15,703
R. Snell, Rotherham	14,380
Inns & Co., St. Mellons	14,232
Bushby & Sons, Leeds	13,673
Yorkshire Hennebique Company, Leeds *	13,779

WELWYN.—For constructing sewers and [illegible] the rural district council. Mr. F. E. Moore, surveyor.

W. [illegible], Fleet Gate, London, E.	[illegible]
G. W. Elkins, Welwyn	[illegible]
J. Newton, Welwyn	[illegible]

WESTHOUGHTON.—Accepted for sewage works extension for the urban district council. Mr. H. Parker, the borough engineer.

J. Dickinson & Son, Westhoughton, £3,500.

WEST SUSSEX.—[illegible] for the Education Committee.

Mr. E. P. Roberts, county education architect:—

New School at Northgate.

C. V. Boughton, Chiddingfold	£2,272
Rowland Brothers, Horsham	[illegible]
J. Barnes & Sons, Brighton	2,059
J. Bonser, Plumpton	[illegible]
H. Cooper & Son, Horsham	[illegible]
Parsons & Frost, Access Godalming	[illegible]
R. Cook & Sons, Crawley	[illegible]
J. Hickman & Murrell	[illegible]
H. Muller & Sons, Limited, Worthing	[illegible]
H. [illegible] & Sons, Midhurst	[illegible]
F. Sendall & Sons, Worthing	[illegible]
A. Crance, Worthing	[illegible]

New School at Lower Beeding (repairs).

G. Graham, Southwick	[illegible]
Rowland Brothers, Horsham	[illegible]
H. Baker & Son, Horsham	[illegible]
A. Crabtree & Co., Crawley	[illegible]
J. Longley & Co., Crawley	[illegible]
J. Barnes & Sons, Brighton	[illegible]
R. Cook & Sons, Crawley	1,656
Murrell Brothers, Horsham	1,647
W. F. Sendall & Co., Horsham	1,642
J. Linfield & Sons, Limited, Littlehampton	1,615
F. Sendall & Sons, Worthing	[illegible]
J. Hickman & Sutfield, Horsham	1,116
A. Crance, Worthing	[illegible]

WIGAN.—For paving work with granite setts, for the corporation.—Mr. A. T. Goodman, borough engineer.

W. K. Worthington, Limited, Manchester	£1,303
T. Horrocks, Westhoughton	[illegible]
Webster & Winstanley, Wigan	1,189
P. Kelmer, Liverpool	[illegible]

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

OCTOBER.

31.—Institution of Municipal Engineers: Eastern and North-Eastern District Meeting at Lincoln.

NOVEMBER.

2.—Royal Institute of British Architects: Ordinary General Meeting. 8 p.m.

2.—Prof. L. E. Matthews on Reinforced Concrete in Municipal Engineering Works. University of London, Gower-street, W.C. 5.30 p.m.

3.—Institution of Civil Engineers: Inaugural Meeting of the Session; Address by Mr. B. Hall Blyth, M.A., the President, and presentation of medals awarded by the council. 8 p.m.

9.—Surveyors' Institution. Mr. H. Clementi Clarke, president, delivers his opening address. 8 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

RHYMNEY VALLEY SEWERAGE BOARD.

RHYMNEY VALLEY SEWERAGE CONTRACTS.

The Rhymney Valley Sewerage Board invite applications for the appointments of Inspectors in connection with the above Contracts, which comprise a Main Sewer, Storage Tanks (partly of Reinforced Concrete), Cast-iron Discharge Mains and Works on the foreshore of the Bristol Channel.

Salary from £2 10s. to £3 per week, according to qualifications.

Previous experience in the superintendence of work of a similar nature is essential, and full particulars of such experience, together with copies of recent testimonials, must be forwarded by the candidates with their applications, in envelopes endorsed "Rhymney Valley Sewerage, Inspectors," and addressed either to Messrs. Chatterton & Alford, 9 Victoria-street, Westminster; or to Messrs. Willcox & Raikes, MM.INST.C.E., 63 Temple-row, Birmingham, not later than October 31st, 1914.

T. J. THOMAS,
Clerk to the Board.

36 High-street,
Bargoed, Glam.
October 9, 1914. (1,996)

RURAL DISTRICT COUNCIL OF CHELMSFORD.

ASSISTANT ENGINEER AND SURVEYOR.

The Council require the services of an Assistant in the Office of their Engineer and Surveyor. Applicants must have had previous experience in Engineering and Surveying, including Water Engineering and [illegible] drawings, taking levels, and supervising [illegible] or erection.

Salary (to include travelling expenses) commencing at £[illegible] per annum, rising by annual increments of £10 (subject to satisfactory service) to £120 per annum.

Applications stating age and previous experience and accompanied by copies of three recent testimonials (which will not be returned), to be sent to the undersigned not later than the 3rd November, 1914.

By order,
ARTHUR S. DUFFIELD.
Clerk.

96 High-street, Chelmsford. (2,022)

ATHERSTONE RURAL DISTRICT COUNCIL.

SURVEYOR'S DEPARTMENT.

Applications are invited for the position of Assistant to the Engineer and Surveyor. Salary at the rate of £100 per annum. Applications, with copies of not more than three recent testimonials, to be sent to me on or before Monday, 2nd November, 1914.

H. J. COLEBY,
Engineer and Surveyor.

102 Long-street,
Atherstone. (2,037)

BOROUGH OF MONMOUTH.

Applications are invited for the appointment of Borough Surveyor and Inspector of Nuisances.

Salary £130 per annum. The person appointed will be required to devote his whole time to the service of the Town Council.

Candidates are requested to apply in own handwriting, and to state age and previous experience and qualifications. Applications, with three recent testimonials, to be received on or before the 14th November, 1914.

BICKERTON H. DEAKIN,
Town Clerk.

Monmouth.
October 28, 1914. (2,046)

WANTED, temporarily, Assistant accustomed to Surveying and routine work of a Municipal Engineer's Office. Salary £2 10s. per week. Applications, stating age, experience, qualifications, and other particulars, accompanied by copies of recent testimonials, to be sent to the Borough Engineer, [illegible] Town Hall, Bournemouth. 2,045

CITY OF BIRMINGHAM.

ENGINEERING ASSISTANTS.

Required immediately, in the Office of the City Engineer and Surveyor, two Engineering Assistants with good all-round experience. Candidates must be good surveyors, levellers and expert draughtsmen, experienced in the preparation of plans, estimates and specifications for public and private street works; also in bridge and roof construction, and in Sewerage. Salary £130, rising by annual increments of £10 to £150, per annum.

The candidates appointed will be required to subscribe to the Corporation Superannuation Scheme, and for that purpose must submit themselves to the Corporation Doctor for examination. The appointments will be subject to the Doctor's report being favourable.

Temporary Engineering and Surveying Assistants having similar experience are also required. These will not be required to subscribe to the Superannuation Scheme.

Applications, endorsed "Engineering Assistant" (or "Temporary Assistant," as the case may be), stating age, qualifications and experience, and accompanied by copies of not more than three recent testimonials, to be delivered at my Office not later than 12th November, 1914.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House,
Birmingham. (2,044)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. NOVEMBER 6, 1914. No. 1,190.

Minutes of Proceedings.

Extraordinary Traffic: "Betterment."

Among the contentions which are sometimes put forward to resist, or at any rate to abate, a claim for extraordinary traffic expenses are two of a directly contrary kind. The nature of these defences may be indicated by two words—extravagance and parsimony. Sometimes it is asserted that the authority have incurred reckless expenditure in what they have done for the restoration of the road—sometimes that they have failed to keep it in a proper condition to sustain the ordinary traffic. Closely connected with the first allegation is the question of "betterment." It sometimes happens that the damage done renders it absolutely necessary to do repairs which, though essential to the rehabilitation of the road, do undoubtedly leave it a better road than it was before the traffic took place. Is this "betterment" to be taken into account and allowed for in assessing the amount recoverable? The authorities are conflicting. In *Smith v. Oswestry Board* (44 J.P., 766) the Court declined to reduce the claim on any such ground. There an indifferent road, sufficient for the ordinary light traffic of the district, after being damaged by the defendant's heavy motor traffic was reconstructed and made into a road of a superior class. Mr. Justice Lush said: "This road was apparently made for a much lighter kind of traffic, and sufficed for that traffic till the engines came to be used. The consequence has been that the Highways Board found it necessary to put the road into thorough repair, and this could not be done without reconstructing it in a better and more permanent manner. It is said that the road is now better than it ever was before. That has, no doubt, been the inevitable consequence of the damage done by the locomotives, and it seems that the board cannot sever the one cause of expenditure from the other. That is not their fault. It must be on the wrongdoer to bear that inconvenience."

This principle was also applied in an unreported case referred to in Mr. Barnard Lailey's "Law of Extraordinary Traffic on Highways" (at p. 70). That was the case of a country lane with a very narrow metalled way bordered by grass waste. The traffic consisted of the cartage of building materials in a continuous string of large carts, passing along the road almost daily for many months. They soon cut through the crust of the road and diverged on to the waste, so that in the winter rains the whole became an almost impassable slough. The highway authority repaired the whole with granite (instead of with local gravel as in the past), the metalled way being thus almost doubled, and the expenditure far in excess of what had ever been spent before either on this road or on an equal length of any other road of the same class. Nevertheless, they recovered the full amount of their claim (*Hertfordshire County Council* v. *Austin*, Herts Assizes, July, 1902). But in a more recent case, where it was not disputed that the road had got a new lease of life, of which the highway authority would have the benefit, Mr. Justice Jelf took a different view. After ascertaining the difference between the cost of the repairs necessitated by the traffic and the normal cost of repair, he deducted one-third of the sum so arrived at as an allowance for the "betterment" of the road (*Kent County Council* v. *Kent Coal Concessions, Limited*, 72 J.P., 507). In the publication to which we have referred above Mr. Lailey argues forcibly, and we think convincingly, in favour of the correctness of the earlier decisions, and contends that betterment is not *in itself* a ground of deduction. If betterment results from needless expenditure, deliberately incurred with that object, no doubt the money unnecessarily spent cannot be recovered. But this results not from the fact of betterment, but because the expense in question cannot be said to have been "incurred by reason of the damage caused." On the other hand expenditure actually necessitated by the damage is none the less recoverable because it happens to result in the betterment of the road. Betterment alone is not evidence of extravagance. No doubt where betterment has resulted the question of the necessity of the expenditure may sometimes be a difficult one to decide.

* * *

A Presidential Address.

The new president of the Institution of Civil Engineers, Mr. Benjamin Hall Blyth, M.A., being the first engineer practising in Scotland who has held that office, took as the general subject of his inaugural address, delivered on Tuesday last, the progress of engineering in Scotland during the last half century. The first part of the address dealt at some length with the railway systems of the country, the mileage of which has almost doubled during the period under review, while the amount of capital invested and the annual number of passengers carried have been quadrupled in the same time. After reviewing the progress as regards dock construction and equipment, Mr. Blyth proceeded to enumerate some of the principal works of water supply which

[illegible] have been constructed in recent years, including the duplication of the aqueduct from Milngavie, Loch Katrine to Glasgow. It supposes that the need of some central control of the sources of supply is felt in Scotland, as in England. If the matter be looked at solely from the financial point [illegible] money might be saved, and the water supply of the country conserved, if some combination took place between [illegible] before any of them were allowed to introduce a new water supply. In the [illegible] for example, every town and village has its own independent supply, with [illegible] water, and separate lines of main pipes bringing the water from the hills to the various points of supply. From this instance, which is fairly typical of many others, it will be seen that much is to be said for Mr. Blyth's suggestion that the Legislature should take care that the question of combination is duly considered before any supply for a comparatively restricted district is sanctioned.

The tribute which the vice-president paid to the great municipalities of Scotland will be read with great interest. He pointed out that tramways are to be found in all the principal cities, being [illegible] on the overhead electric system, with the single exception of Edinburgh, which remains loyal to the cable. The principal advantages of this system are the low cost of working, and—in the case of a beautiful city like Edinburgh—the absence of overhead wires. The great cost of constructing new routes, however, virtually precludes extensions into outlying districts with comparatively small populations, a factor which may be far reaching hindering development. In speaking of the work which has been accomplished in regard to town planning, we venture to think that Mr. Blyth took a rather narrow view of the intentions and possibilities of the Act. If it be true, as he suggests, that corporations, both in Scotland and England, have lost their heads in regard to this matter, it must be equally true that the Local Government Board are in the same condition. Mr. Blyth cites the cases of Dumbarton and Edinburgh, and asserts that all over Scotland this Act is being strained to its utmost extent by corporations in order to make provision far in excess of anything needed in the near future. In our view this is exactly what the Act intended, and although there may be some room for difference of opinion as to how far the "near future" extends, we are bound to dissent from the view that there has been anything like a general tendency to look too far ahead, and to reiterate that if this has been done the central authority must share the blame with the local authorities.

Roadside Waste. It is a well-known presumption of law that, as a general rule, where there is a highway with fences on both sides the public rights extend to the whole space between the fences. The disadvantage of a presumption is that it may be rebutted, and this presumption is no exception. Accordingly there are several reported cases in which the right of an adjoining owner to strips of greensward adjoining the metalled road has been established, and the claim to include them as parts of the highway has been negatived in consequence of there having been circumstances to rebut the ordinary presumption. From these cases it would appear that the usual grounds on which the claim of the landowner is allowed are either that the disputed ground is or has been part of the [illegible] manor, or that it has been used as private property, and in a manner inconsistent with the existence of public rights. Where, however, notwithstanding acts of ownership by the landowner, there has been a certain amount of public user also it may be a matter of some difficulty to determine whether the presumption holds good.

This state of affairs existed in *Attorney-General* v. *Lindsay-Hogg* (76 J.P., 450). This case was concerned with three roadside strips partly overgrown by trees and underwood, and separated from the adjoining land by an old, irregular hedge on the top of a steep bank. Evidence was given on the one hand, not only of numerous acts of user by the public, but also of the taking of gravel from the land for the purpose of repairing the road. On the other hand, the landowner proved many acts of ownership by his predecessors in title and himself, and the Court came to the conclusion that his evidence outweighed that of the highway authority. Another circumstance which influenced the decision was the fact that the old hedge was originally planted naturally. This in itself probably would not have been conclusive, but in the opinion of the Court it showed that the hedge had no connection with the laying out of the road, and therefore that there was no presumption that it formed the boundary of the highway on that side. In the case of unfenced roads, such as, for instance, those running across a common, the presumption does not arise, and where one side only is fenced it only applies to that side. Where it is clear that a strip does form part of the highway the highway authority would be justified in resisting, by breaking down fences if necessary, any attempt of the landowner to enclose it. But it would be prudent, in disputed cases, before taking this course to obtain a judicial decision, and thus avoid a possible action for trespass.

* * *

War and the Professions. Among the first concerns of the authorities on the outbreak of war was to anticipate and provide for the inevitable distress among the industrial classes consequent upon the dislocation of trade and the sudden removal to the colours of large numbers of breadwinners. Owing to the generosity of the public in subscribing to the Prince of Wales' and other funds, great strides have been made towards meeting this need, and it is now necessary to remember that there are other classes of the community which have been hit even more promptly and severely than their ordinarily poorer fellows by the sudden dislocation of business which has taken place. We refer, of course, to the professional classes, and particularly to those whose prosperity depends upon the maintenance of peace conditions. Among these people there exists at the present moment a very real and widespread distress, the tragedy of which is in most cases increased by the natural reluctance to disclose their private trouble or to make any claim upon the charitable resources of the country. To meet the pressing needs of these people there has been formed a Professional Classes War Relief Council, for the purpose of giving assistance chiefly in the matters of education, training, emigration, maternity aid, and temporary employment. The council consists of representatives of the chief professional institutions and of the principal societies engaged in the work of organising relief, and we feel sure that they will command much sympathy in their work of assisting a very deserving class over the war period. We venture to bring the work of this council to the notice of our readers, feeling that many of those whose remuneration and security remain unaffected by the war may desire to take the opportunity of assisting their colleagues in kindred professions who are not so fortunately

situated. The offices in the council are at 13 and 14 Princes Gate, S.W.

* * *

Refuse Disposal. The second of the public lectures delivered by Prof. R. E. Matthews, the Chadwick Professor of Municipal Engineering in the University of Manchester, dealt with the important matters of the collection and disposal of house refuse. As regards collection a theoretically perfect scheme, as Prof. Matthews pointed out, would dispose of the contents of each house with a suction pipe leading to the destructor. Could this ideal be realised, however, certain practical problems present themselves, one of the most important of which is as to the type of vehicle to be employed. It is generally agreed that, whatever kind of van is used, each should be provided with a metal cover so as to prevent the creation of an objectionable nuisance by the refuse blowing or falling about. A larger question arises, however, in regard to the comparative merits and economy of horse drawn and motor vehicles. For the ordinary work of collection the motor is probably wasteful, owing to the necessarily frequent stoppages. For conveying the refuse to the destructor, however, the motor would appear to be better adapted, and it has been used with considerable success in Paris and other French towns. In this country, on the other hand, the horse-drawn vehicle is in almost universal use, and evidence is really lacking as to the economy of the motor, chiefly on account of the time the vehicle must necessarily stand idle. Prof. Matthews reviewed the several methods of disposal that are in vogue and was, of course, driven to the conclusion that the only really satisfactory method of dealing with the refuse of a town is to burn it. Once this conclusion has been reached, the only two remaining questions are as to the selection of a suitable site and the choice of the best type of destructor. In the lecture which we hope to present at length in next week's issue, both of these matters were dealt with in a very practical way.

* * *

The Hydraulic Mining Cartridge. Various devices have been brought forward from time to time for the purpose of avoiding the use of explosives for removing rock and other material in places where the shock attendant upon blasting operations would be dangerous to surrounding buildings. Even when blasting operations are conducted in the open it is often difficult to limit the results of the explosion to the desired extent. By the use of the hydraulic mining cartridge, as described in a paper read before the Society of Engineers by Mr. James Tonge on Monday evening, these difficulties may be avoided. In the course of his paper Mr. Tonge drew an interesting contrast between the effect of powerful hydraulic pressure on sandstone and concrete. In the former case there is comparatively slight crushing of the rock before the full pressure of the rams has the effect of causing the mass to bend; considerable pumping and consequent travel of the rams is then necessary before the rock finally begins to crack and break away. With concrete, however, there is usually a perceptible interval during which the rams are crushing or compressing the material, and no movement is noticeable; after this is accomplished a few more thrusts of the rams cause the whole mass to break up without any indications of bending. It may still be necessary to continue to apply pressure and to increase the size of the breaks in the mass, but the greatest shattering effect will have been accomplished at the first disclosure of the cracks, the pressure required to break the mass afterwards gradually diminishing. An example given in the paper of the successful removal of a solid concrete bed from a municipal electricity works, in close proximity to very valuable boilers, engines, and switchboards, proves the efficacy of the cartridge.

* * *

Disease and War. At the annual meeting of the Sanitary Inspectors' Association, which was held at Caxton Hall on Saturday last, Sir James Crichton Browne delivered a characteristically eloquent address on "The War in Relation to Sanitation." The subject is one upon which we have said a good deal during the past few weeks, realising to the full the important part which preventive medicine plays in securing the welfare of those who are actively engaged in fighting their country's battles.

After commenting upon the successful work carried out in regard to camp sanitation, Sir James pointed out that with the scrupulous cleanliness that was possible in camps and barracks, as in the country, and with the realisation of the value of the open order and no overcrowding, as opposed to the close formation in resisting the attacks of disease as well as the enemy in the field, typhus fever and the devastation of armies in the past need not be feared; at the same time typhoid fever is still a serious menace. With the experience gained in past wars to guide them, we are confident that the authorities are fully alive to the importance of the whole subject, and those who are enlisting can do so with sure and certain knowledge that as regards disease their risks in the present war will probably be less than in any previous campaign. Sir James advocated that our Army of the future should have a special sanitary corps acting under the Army Medical Department, and with suitable military rank. Something is already being done in this direction, and it is earnestly to be hoped that one result of the present disastrous conflict may be to put this important branch of military organisation on a suitable and permanent footing.

* * *

A Welsh Rural Appointment. Among the "plums" of the municipal engineering profession there should be found, surely, after it would be surely the height of injustice to exclude that of the highway surveyorship of Llanybyther. The rural council of this district have issued an advertisement for such an officer, and they are offering the munificent salary of £45 per annum. For this sum the person appointed, so runs the advertisement, must devote three days at least per week on an average to the duties of the office, and whenever the roads are being steam rolled he must attend the work throughout. In addition, he "must also, if and whenever occasion requires, give such additional time as may be necessary in urgent cases without any extra payment." This clause, with the steam roller supervision thrown in, could, of course, be pleaded as justification for extending the "three days at least" per week to six; there is, in fact, no limit to what it may imply when put into practice. But even this does not exhaust the possibilities of the situation, for it is also required that the lucky holder of the position "must prepare all plans and specifications of bridges and other works in connection with the repair and maintenance of the roads, and superintend the same without any extra payment." Also, it is insisted that he shall have a fixed abode in the district. There is probably more than meets the eye in this last-mentioned condition, for it might be contended with some plausibility that a "fixed abode" and the workhouse are merely convertible terms.

Camp Sanitation.

(3.)—ABLUTIONS.

[illegible]

[illegible] precautions are necessary in respect to supplies; but in [illegible] are provided with ball hydrants, as the spilling of dirty water in their vicinity might cause fouling of public supplies.

When a stream affords the supply, all washing must [illegible] ing water for men and animals. Should other units or persons require the same stream below the camp, the water for washing purposes must be drawn, and when dirty disposed of in a safe manner, and under [illegible] be a nuisance wherever may washing in the stream itself be permitted. In temporary camps of more permanent character benches are usually provided for ordinary ablutions.

I recently designed a washing-place for 200 men. This was provided with a concrete floor laid to suitable falls to the centre, which consisted of a channel formed in cement. A galvanised-iron roof was provided with sides and back, but no front. The washing benches were of a flat type.

In the open, in view of the impossibility of preventing the ground becoming sloppy, the following arrangement is recommended:—

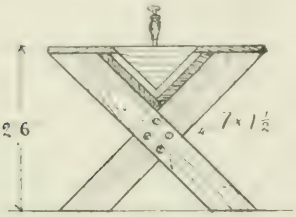
A bench consisting of a V-shaped trough, with sides not less than 12 in. in width, and fixed to give a fall to one end, not less than 2 in. in 6 ft. On both sides a shelf, not less than 9 in. wide, is fixed level; this necessitates the V-shaped trough being constructed from boards tapering in width to allow a suitable fall to the trough base, while avoiding sloping shelves. A tap is provided at the higher end; a grease pit is necessary below the outlet. When dirty, the water is turned into the trough to discharge into the grease pit, and is subsequently disposed on a series of shallow trenches arranged in pairs for use on alternate days. Local conditions govern the disposal arrangements, and may require secondary and even tertiary filtration; surface filtration is generally preferable to subsoil soakage. A paving of stones or wood gratings, consisting of slate battens 1 in. apart, and ledgered at intervals of 2 ft., should be provided for the men to stand on.

In the absence of wood troughs, canvas may be adapted, but, having been used for soapy water, the canvas cannot again be considered fit to hold drinking water for men or horses. The same conditions must, of course, be observed in respect to bathing in streams as with ordinary ablution.

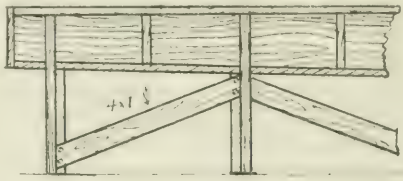
In the absence of anything more suitable, marquees may be erected, and metal baths provided in canvas cubicles. Care is required in respect to the disposal of the foul water. By excavation in the earth and [illegible] bath can be provided. The water supply may be obtained by damming a stream and diverting the required amount of water, or, if obtainable, from a tap [illegible] pipe in [illegible] A [illegible] channel [illegible] provided leading from the lower end of the bath to the waste-water trenches.

For clothes washing a difficulty may be found in the subsequent drying, and when outdoors drying is impossible, the provision of a tent or shed is desirable. The necessary heat may be supplied by the familiar "devil" or coke-burning [illegible] The disadvantage of coke smoke would outweigh the advantages of the heat of that fuel, but charcoal has been found very successful. To make charcoal, a pit, from 2 ft. to 3 ft. in depth and 4 ft. to 5 ft. in diameter, should be dug. In this a fire is made and fed continually so as to [illegible] that, as the hot embers sink to the bottom, the pit remains full of fuel. When the resultant embers reach the top of the pit, sufficient fuel should be added to a height of 18 in. above ground level, and the excavated earth covered over the burning mass. I have experimented with several earths, and find a fine loamy soil gives the best results, as hard earths do not provide an airtight cover. At the end of twenty-four hours a pit full of charcoal will be obtained. Hard woods are preferable if obtainable.

In the absence of clothes-horses, useful substitutes may be made from wires stretched on posts. Copper or galvanised material should be used for this purpose, as the ordinary iron wire may leave rust marks.



End Elevation



Part Side Elevation

Washing Bench.

Rural District Councils. According to the annual return, published last Friday, there are 652 rural district councils in England and Wales. The receipts (exclusive of borrowed money) of the councils during the year 1912-13 amounted to £4,962,859, and the expenditure, apart from money received from loans, was £4,992,456, an increase of £53,044. The repayment of interest on loans in England amounted to £533,445, and Wales £60,315. In England the sums repaid for principal and interest on sewerage and sewage disposal works was £290,490, and on waterworks £161,431. The aggregate length of roads under the supervision of the council was 99,963 miles, comprising 5,027 miles of main roads. The average cost per mile of main roads in England was £85 16s., and in Wales £74 5s. On other highways the cost per mile was: England, £25 7s.; and Wales, £15 18s.

Society of Architects: Architectural Competitions.—In order that injustice shall not be done to graduates or students of the society on active service, the council have decided to suspend all the society's competitions for the coming session, and in the case of those on active service to waive the age limit, so that all may start fair when the competitions are resumed in the following session or when the war is over. The council have approved the work done by the holders of the Travelling Studentship and Scholarship during the present session. The holder of the former, Mr. Charles Bell, of Aberdeen, receives £25 and a silver medal, and the holder of the latter, Mr. F. M. Cashmore, receives £10. The scholarship competition this year only produced two entries, probably owing to the war. The designs were not considered of sufficient merit for the scholarship to be awarded, but a prize of the value of £5 5s. has been given to the winner, Mr. Charles Bell, of Aberdeen.

Institution of Civil Engineers.

MR. BENJAMIN HALL BLYTH'S PRESIDENTIAL ADDRESS.

Although Mr. Benjamin Hall Blyth, who on [illegible] delivered his inaugural address as president of the Institution of Civil Engineers, is not the first Scotsman who has occupied that position, he is the first engineer practising in Scotland on whom the honour has been bestowed. Considerably more than half of Mr. Blyth's address was devoted to the development of the Scottish railway systems during the past fifty years—a period which, by the way, corresponds very nearly with the term of the new president's professional life. Some remarks on [illegible] were [illegible] of waterworks, [illegible] Edinburgh, Glasgow and Aberdeen coming in for special mention.

WATER SUPPLY IN SCOTLAND.

Mr. Blyth [illegible] the Local Government Board [illegible] and took care that adequate supplies of water were provided where they were required, pointed out that much money might be saved, and the water supply of the country conserved, if more combination took place between adjoining burghs and between burghs and counties before any of them were allowed to introduce a new water supply. His view was that it would be far better if a number of places in adjoining districts combined and introduced one large comprehensive supply rather than that each separate place should have an independent supply for itself.

"Take, for instance, my own county of East Lothian," he said. "There every town and village has its own independent supply, with separate reservoirs, separate compensation water and separate lines of main pipes bringing the water from the hills to the various points of supply." He thought it would have been infinitely better, and much more economical, if all these places had combined and had one comprehensive scheme dealing with the whole county.

"Is it," he asked, "too much to hope that in future—and much remains still to be done—the Legislature will take care that this question of combination is duly considered before any supply for a comparatively restricted district is sanctioned?"

Dealing with the question of the quantity of compensation water that should be given off, the president said it seemed absurd that this should be left to be fought out under every little Bill, and it should be fixed definitely by the Legislature. It often happened that the promoters of a scheme—where no landed proprietor had a sufficient interest to oppose it—got off with the provision of far too small an amount of compensation water. This matter was really a national one, and should be settled, not in the interest of any individual proprietor, but of the public at large. When the available sources of supply were yearly becoming more and more scarce, it was essential that adequate provision should be made to secure that our rivers and streams had at all times a sufficient supply of water sent down them.

TRAMWAYS.

The great municipalities of Scotland, the president observed, were keeping pace with the times, and had for many years past been doing much to improve the cities over which they had control. Tramways were to be found in all the principal cities, and in many country districts as well, and these, with the single exception of Edinburgh, were worked on the overhead electric system. In Edinburgh, where the cable had been adopted about twenty years ago, the cost of working was 1d. per car-mile less than that of any other system in the country. Although the cable system was costly to instal in the first instance, once it was installed it was worked far more cheaply than any other system. In Glasgow, where much had been done for the improvement of the amenity of the city, one of the principal works undertaken by the corporation, assisted by adjoining counties, was the purification of the river Clyde.

TOWN PLANNING.

The president, proceeding to refer to the Town Planning Act of 1909, said it seemed to him that corporations, both in Scotland and England, had quite lost their heads with regard to the administration of that Act. No doubt broad streets and roads and large open spaces in towns of all sizes were of great benefit to the people, but surely the provisions of this Act could be, and were in some cases being, carried much too far.

"Take the case of the burgh of Dunfermline, a burgh which has a population of about 28,000, covering an area of 2,032 acres, more than half of which is at the present time unbuilt on. It acquired under the authority of Parliament between 5,000 and 6,000 acres of what is purely agricultural land, and it has completed a town planning scheme for the whole of that area. Unless something very extraordinary happens, this area of ground cannot be filled with houses for more than a century, and yet the corporation are going to spend immediately a very large sum of money in laying out roads and sewers for the town planning of this district.

"Again, take the case of the city of Edinburgh. The corporation own a large area of ground, extending to something like 90 acres, in the neighbourhood of the new cattle markets, available for feuing purposes, and at a recent meeting of the corporation it was decided by a majority that no building to be put up on that ground is to exceed three storeys in height. The streets are to be wide, and several open spaces are being provided, and in Edinburgh, which has some old buildings from twelve to fourteen storeys high, it seems absurd to restrict new buildings on this area to three storeys. If the height had been increased to four storeys it would have meant a saving to the citizens of upwards of £3,000 a year."

These were only two instances, but all over Scotland this Act was being strained to its utmost extent by corporations in order to make provision far in excess of anything needed in the near future.

ENGINEERING MADE EASY.

Mr. Blyth said he would next like to point out to the engineers of the present day how much more easy it was now, from every point of view, to carry out big works than it was at the beginning of the period with which he was dealing.

In questions of construction they had now the benefit of pneumatic and hydraulic pressures, and of electric energy. They used to an enormous extent Portland cement, which was first used, in Scotland at any rate, in 1870, but then only as a lime in which brickwork was set. The first notice he had of it being used for cement concrete was in 1877, when so little was known about Portland cement itself that no tests were specified with regard to it. Then there was the substitution of steel for iron, which enabled larger spans to be built, while preserving the same margin of safety.

In the early days of the period I am dealing with engineers had to specify and supervise the construction of all temporary huts for workmen. Now that was all undertaken by the Local Government Board, and the contractor had to comply with their requirements. In some of his old specifications, after stating the sizes of the houses and the number of cubic feet, &c., to be provided in workmen's houses, the following clause occurred: "Each bed to contain not more than two men, and to be at least 6 ft. long and 4 ft. wide inside." That specification was in use for many years, and, as far as he could make out, up to 1874.

"I am afraid," remarked the president, "the navvies in those days must have been of a smaller size than many we see about us now."

Apart from the mere question of construction, the whole routine office work was much simpler than in the early days.

What had further tended to simplify all engineering works was the standardisation which had been undertaken by the British Engineering Standards Committee. Now, instead of having a long specification with regard to, say, cement or steel, a specification simply provided that these must comply with the requirements of the Engineering Standards Committee.

Ordnance sheets were only just being introduced fifty years ago, and he remembered quite well hearing his father say that he thought the introduction of ordnance sheets would be the ruin of civil engineers, a great part of their work in those days consisting

in surveying and preparing plans of the estates of landed proprietors. Instead of being the ruin of civil engineers, he supposed there was nothing that had tended more to simplify and enable them to carry out their work more efficiently and rapidly than the introduction and use of ordnance sheets.

As these applications meant just the same as in any other trade or profession, the introduction of more machinery and the consequent employment of less personal labour.

REINFORCED CONCRETE.

Turning to the question of the use of reinforced concrete, the president remarked that, while for certain structures that material might have its advantages, it was in many cases used for ordinary construction where stone or brickwork or steel would be much better, and, as far as he could make out, in most cases would be cheaper. That led him to observe that, both as regards particular methods of construction in reinforced concrete adopted by individual firms as well as other constructional and inspecting work undertaken by joint-stock companies, great efforts were continually made to secure the execution of work irrespective of designs which would, in the ordinary course, be prepared by independent professional engineers.

Unfortunately, men who were members or associate-members of the institution were often also members of, or agents or advisers of, those companies, and thus took part in extending the operations of persons who, properly enough engaged in the supplying of materials or erection of structures, sought to include at the same time all the professional functions of advising, designing and supervising.

Further, as they were aware, the institution had set its face rigidly against any advertising for professional advisory work on the part of its members; but while this regulation was adhered to by individual members, companies which contained or were served by members of the institution advertised broadcast for work, frequently using the names of members in the advertisements, and the council felt that members of the institution who were acting for such companies were breaking the regulations that had been made.

This matter was at the present time receiving the most anxious consideration of the council, and it was their intention to take some steps to put a stop to the practice he was alluding to.

ROAD MAKING.

There was, observed the president in conclusion, one matter which was urgently calling for the attention of all engineers. He meant the question of road making, with special regard to the ever-increasing use of motor vehicles.

Many specifications had been proposed up to the present time, but so far he had not seen one that fully met the requirements of all parties concerned. Unless they were to have absolutely separate roads in the country for motor and horse traffic, a specification for the construction of a new road must give due weight to the requirements of each of these kinds of traffic, and a road must not be made so that it was fit for motor-car traffic and useless for horse traffic, or fit for horse traffic and useless for motor-car traffic.

What was wanted was a road with a strong bottom, but with a certain amount of yield in it, and this must be covered with some special bituminous or non-absorbent material very carefully put on, bound together with tar or some other adhesive substance, so as to give an absolutely smooth surface, and minimise the quantity of dust created by the travelling of motor vehicles. He had no doubt that after a few more experiments engineers would be able to construct roads that would give satisfaction to everyone using them.

Electricity and Gas Extensions at Barrow.—At a meeting of the Barrow Council recently the Electricity Committee reported on the agreement with Messrs. Vickers to supply the Barrow shipyard with electricity running to 5,000,000 units per year for three years. This would necessitate increasing the plant at the Barrow electricity works at a cost of £13,000. This scheme was adopted. Certain members took strong objection to the hanging up of a scheme already approved for new gasworks to cost £70,000, the tenders for which had already been received, arguing that capital expenditure should not be curtailed in Barrow, which was so busily engaged in the manufacture of munitions of war. It was agreed to go on with the works.

REINFORCED CONCRETE IN MUNICIPAL ENGINEERING WORKS.

On Monday evening last the third of a series of public lectures was delivered by Prof. E. R. Matthews, Assoc.M.Inst.C.E., Chadwick Professor of Municipal Engineering in the University of London.

Taking for his subject "Reinforced Concrete in Municipal Engineering Works," Prof. Matthews remarked that the material was not a new one. Its discovery was claimed by the Germans, who, however, claimed many things which they had no right to do. Actually it was used 100 years B.C. by the Romans in the covering of the roofs over their large tombs. The reinforcing material they employed consisted of bronze rods, but the concrete, they might be sure, was very poor compared with what we used to-day. About sixty years ago the French people took up the material very earnestly, and at the Exposition of 1867 there were a number of exhibits of reinforced concrete work. Since then the Germans had used a great deal of it. But America had been the leader; no country had used more, and the material was growing in favour as a result of the experience which had been gained. It had been used there for all sorts of purposes—often when it was inadvisable.

British engineers seemed to be rather conservative in their ideas with regard to adopting any new material, and it was some time before they looked upon reinforced concrete with favour; municipal engineers were now, however, commencing to use it a good deal. Some isolated cases of corrosion of the reinforcement had resulted in certain engineers refusing to employ it. He might say, however, that some years ago he carried out tests with a number of blocks of reinforced concrete about 1 ft. cube in size. Some of these were put in the sea at low water, others in fresh water, and a third set were left in the open air, and in no case did he find the least corrosion; in fact, reinforcing bars which, when put into the concrete were covered with red rust, when taken out were found to be quite bright. He once had occasion to take off the roof of an underground lavatory which leaked badly. The steel joists of this were embedded in concrete, but the bars showed no signs whatever of corrosion. He had found the same thing in a sea wall which he had to repair, and he thought such experiences tended to strengthen one's confidence in reinforced concrete. Corrosion did not bother him a bit, if the concrete was properly mixed and the reinforcing bars were thoroughly covered. He wished at the same time to utter one word of warning. Cinder concrete must not be used for reinforced concrete work, his experience of that being that, owing to the chemical action that was set up, corrosion occurred.

Prof. Matthews went on to refer to the use of reinforced concrete in the construction of sewers and aqueducts. Proceeding to deal with its advantages, he remarked that no material could be constructed more rapidly, the cost of maintenance was low, expansion and contraction were practically the same, and, of course, the concrete did not deteriorate, but increased in strength with age. He hoped the time would come when the municipal engineers of this country would adopt it more extensively, because he believed it was possible by its use to effect a saving of from 20 to 30 per cent. Touching upon its employment for purposes of sea defence, he said that, generally speaking, he did not recommend its use in that connection. In many other directions, however, he strongly advocated its employment.

Town Planning Institute.—A meeting of this body arranged for November 13th has been postponed. At the meeting in question, Mr. Percy T. Runton, A.R.I.B.A., was to have read a paper entitled "The Industrial Village."

Manchester's New Library.—A new public library at Chorlton-cum-Hardy was opened on Wednesday. It is the outcome of a gift of £5,000 by Mr. Carnegie, and has been erected in accordance with the designs of the city architect, Mr. Henry Price.

Proposed New Road in Durham.—The Durham University authorities have granted 1 acres of land to the Durham Corporation for the purpose of making a road between Durham and Shincliffe. The scheme is to be carried out in the event of distress arising out of the war.

Traffic on the Great Western Road.

A CHISWICK CENSUS.

A census of the traffic passing over the High-road, Chiswick, between the hours of 6 a.m. and 10 p.m., has been taken by the engineer and surveyor to the urban district council, Mr. E. Willis, ASSOC.M.INST.C.E., on the lines laid down by the Road Board in connection with the classification of roads. The statistics obtained are as under:—

Classification of vehicles.	Assumed average weight. Tons.	Number each day of 16 hours. 1st July.	2nd July.	3rd July.	4th July.	5th July.	6th July.	7th July.	Total in seven days. Number.	Weight in tons.	Average number per day.	Average weight per day.
ORDINARY CYCLES ...	0·09	3362	3668	2478	4978	2103	3134	4255	23678	2131·02	3382·57	304·43
MOTOR CYCLES ...	0·13	205	215	70	277	202	182	229	1380	179·40	197·14	25·63
MOTOR CARS (including motor cabs and any other motor vehicles not specified) ...	1·6	1225	1387	1230	2354	1669	1130	1137	10132	16211·2	1447·43	2315·88
MOTOR VANS (covered)	2·5	221	246	263	232	25	248	264	1499	3747·5	214·14	535·35
MOTOR OMNIBUSES ...	6·0	977	982	950	1173	882	929	944	6837	41022·0	976·71	5860·28
MOTOR LORRIES (rubber tyres)	6·0	86	99	88	66	18	84	127	568	3408·0	81·14	486·85
TRAILERS to rubber-tyred lorries	5·0	4	2	—	2	—	3	2	13	65·0	1·66	9·28
MOTOR LORRIES (steel tyres)	10·0	31	20	23	11	1	47	42	175	1750·0	25·00	250·0
TRAILERS to steel-tyred lorries	5·0	14	3	14	5	1	28	33	98	490·0	14·00	70·0
LIGHT TRACTORS ...	5·0	24	15	22	20	—	14	11	106	530·0	15·14	75·71
TRAILERS to light tractors	5·0	8	12	14	11	—	8	9	62	310·0	8·85	44·28
TRACTION ENGINES ...	12·0	23	33	25	7	2	12	2	104	1248·0	14·85	179·71
TRAILERS to traction engines	8·0	19	36	23	3	2	15	4	102	816·0	14·57	116·57
Total motor vehicles and trailers		2837	3050	2722	4161	2802	2700	2804	21076	69777·0	3010·85	9968·14
LIGHT VEHICLES (one horse)	·4	981	989	963	878	119	941	960	5831	2332·4	833·00	333·20
LIGHT VEHICLES (two or more horses) ...	·6	62	93	102	56	19	67	61	460	276·0	65·71	39·43
HEAVY VEHICLES (one horse)	1·25	805	776	1038	943	37	908	944	5451	6813·75	778·71	973·39
HEAVY VEHICLES (two or more horses)	2·5	408	417	468	420	25	468	495	2701	6752·5	385·71	964·64
OMNIBUSES (two or more horses)	3·0	—	—	—	5	—	7	—	12	36·0	1·71	5·14
Total horse-drawn vehicles		2256	2275	2571	2302	200	2391	2460	14455	16210·65	2065·0	2315·8
TRAMCARS (electric) ...	—	1274	1310	1284	1267	990	1258	1265	8648	—	1235·42	—
Horses (led or ridden)	·5	51	73	44	66	—	84	71	389	194·5	55·57	27·78
Cattle	·3	—	—	—	—	—	—	—	—	—	—	—
Sheep and pigs ...	·1	—	—	—	—	—	—	12	12	·12	1·71	·02
Hand-carts and barrows ...	—	441	388	515	560	111	389	411	2815	—	402·14	
Horses drawing vehicles (to be calculated from number of vehicles) ...	·5	2726	2785	3141	2783	244	2933	3016	17628	88140·0	2518·28	1259·14
Grand total ...		12647	13549	12755	16117	6450	12889	14294	88701	97127·29	12671·57	13875·32

NOTE.—Steam rollers not recorded.

The Abnormal Development of Coventry.

SOME OF ITS TOWN PLANNING AND HOUSING PROBLEMS.*

By J. E. SWINDLEHURST, [illegible], City Engineer and Surveyor, Coventry.

In the year 1906 Coventry [illegible] is locally known as the "cycle boom." This con[illegible] ment took place. Following this, in 1908, the author was engaged laying out a park and other works as "relief works" for the unemployed. This latter [illegible] depression in the city; yet, notwithstanding this, there were very few empty houses, and shortly after, when

MR. J. E. SWINDLEHURST, M.INST.C.E.

the introduction of new industries led to greater demands for labour, housing accommodation was severely taxed. At the census of 1901 the population of Coventry was 69,978. At the census of 1911 the population was 106,349—an increase of 52 per cent for the ten years, or at the rate of 3,639 persons per annum. The population at the middle of the present year is estimated by the medical officer of health to reach 120,000. The number of inhabited houses at the 1911 census was 23,042, or at the rate of 4·6 persons per inhabited house. The estimated number of inhabited houses at the present time is 26,250. The last extension of the city boundary was in 1899, so that the above increase has not been due to any cause of this nature.

A gradual but continual influx of new population into a town where the number of houses has for some years been little, if any, in excess of the normal requirements invariably leads to development in house building. In the case of Coventry, during the last several years, the conditions have not been that of a normal development due to a progressive town of this size; they have in every sense been abnormal, while, as regards house building, the utmost efforts of private enterprise have at no time kept pace with the demands. This is evidenced by the fact that a very large number of men working in Coventry are compelled to live in the surrounding towns, while almost every edition of the local Press contains offers of premiums for houses. Consequently, extensive areas of land in proximity to the built-up area of the city have been brought into the market, laid out as streets, and buildings erected. . . .

The total number of houses erected and completed in the city during the period from January 1, 1900, to April 30, 1914, is 11,394. Of this number, 8,106 houses have been erected and completed on new estates which have been developed during the period named, and in addition 474 houses are in course of erection on such estates. It will be seen from the above that 3,288 houses have been erected and completed in other parts of the city, on sites in existing [illegible] 1900, but which had not been built up.

It is the object of the author to review, on very broad lines only, certain conditions which have prevailed in this abnormal increase of the city, together with the special problems as regards estate development, buildings, and housing conditions which such a state of things entails upon the local authority. . . .

Unlike many towns, where practically the whole of the land belongs to one or two large landowners gifted with broad and philanthropic views, the land in Coventry belongs to numerous owners. Such conditions (in the absence of ample powers) have not rendered the position less difficult from the point of view of arranging a systematic and comprehensive plan for dealing with the land as a whole. Following upon the demand, land for building purposes within the city has come into the market at constantly advancing prices, and sites varying from 1 or 2 acres in extent to over 54 acres have been dealt with as separate building estates.

The laying out of these estates by landowners, but more especially by land speculators, was proceeded with immediately the plans were approved. In some cases the estates have been entirely built up, in others the streets have been laid out and formed, the sewers constructed, and a considerable number of houses erected; yet these are not entirely built up. In either case the Housing, Town Planning, &c., Act cannot, for practical reasons, be made operative.

The degree of control in the laying out of estates and the erection of buildings, so far as the governing authority is concerned, is, of course, ultimately comprised in the legal powers they possess. The local by-laws in force in Coventry are practically the model form of by-laws issued by the Local Government Board. Under these by-laws streets are required to be 40 ft. in width; the distance at the rear of houses must extend laterally for the full width of the house for a depth of at least 20 ft., and have a minimum area of 300 super. ft. All habitable rooms are required to have a height of 9 ft. and a capacity of not less than 900 cub. ft.

The Coventry Corporation of 1900, *inter alia*, empowers the corporation to prohibit cul-de-sac streets, and also requires, except with the consent of the corporation, the construction of intersecting streets at a distance of not more than 150 yds.

Prior to the Housing, Town Planning, &c., Act becoming law, the powers possessed by the local authority were altogether too limited to enable any comprehensive and far-reaching scheme to be put into force as regards town planning. This being so, it has been the special care of the authority, in all cases, to endeavour to obtain such conditions in the laying out of new estates as were compatible with a wide view of the whole of the surroundings. It has rarely happened that the estate plans as first presented have, in fact, been approved in that form. In some cases, as was inevitable, the pecuniary interests of the estate or building owners conflicted with the interests of the community. Whenever this has been the case we have endeavoured, by negotiation, moral suasion, and in some cases by payment, to effect improvements, which in nearly every case have resulted in satisfactory arrangements being made. This, after all, is the true spirit which the Town Planning Act enforces throughout its whole extent, which is still further emphasised by the Regulations, and is, moreover, a principle which has been applied in this city for many years in difficult circumstances with good results.

Such a policy has resulted in single estates being so laid out as to form part of a comprehensive layout of areas much larger than itself. In some few cases the author has succeeded in obtaining certain restrictions in the laying out of the land before this came into the hands of the speculator. Whenever it appeared desirable that a proposed new street should follow a certain line, it has almost invariably been secured, while as regards streets which were likely to be through traffic routes in any particular district, it has been arranged for such streets to be of greater width than the by-laws required. These traffic streets

* From a paper read at the annual general meeting and conference of the Institution of Municipal and County Engineers at Cheltenham.

[illegible]

With [illegible] be continued to the boundaries of such estate, or the space reserved, so as to enable the same line to be maintained on the adjoining estate. Considerable attention has also been given to the important detail [illegible] and wherever it has been possible to do so we have induced the builders to set back the houses at these points in all important streets. In many streets trees have been planted on the footpaths at the expense of the estate owners.

[illegible] ROADS.

[illegible] abutted on existing old highways, either main roads or roads more or less rural in character. Coventry is fortunately placed in having reasonably wide main roads converging to the city from almost every direction. It is only when these roads actually reach the old parts of the city that they unfortunately lose their wide character and become merged in the narrow streets. Every opportunity has been taken to widen and improve these main roads along the frontage of new estates.

The old rural roads were very different, usually about 20 ft. wide, or less. Many of the new estates have a considerable frontage to these roads, and in dealing with them the practice has been as follows: In all cases where a development seemed even likely to take place, or isolated buildings were contemplated, the author prepared a plan and section of the entire length of the existing highway. The possible necessities of the road as regards traffic, due to the future development of the district, were considered, its ultimate width determined, and improvement lines laid down. This was done in many cases some years before the necessity for dealing with the particular road became operative. Upon plans for a new building estate, or the erection of new buildings abutting on such roads, being presented, advantage was taken of this, and by negotiation and arrangement the estate owners were induced to conform to the improvement lines, and in many cases also to substantial alterations in the levels.

Thus these old highways, wherever developments have taken place, have been widened and improved partly at the cost of the corporation and partly at the cost of the person laying out the estate, the width now being between 40 and 60 ft. . . .

TYPE OF BUILDINGS ERECTED BY PRIVATE ENTERPRISE.

The type of dwelling which appears to be most in demand, and which has been mostly provided, is a self-contained house with a frontage varying from 12 to 15 ft., and provides parlour, kitchen, scullery, out offices, and three bedrooms. These houses are built in rows, the depth of the site being about 90 ft. as a rule, and in most cases the houses are set back from the street line 6 ft. and over. In addition to this, houses having only two rooms on the ground floor and two bedrooms have also been provided in considerable numbers. Many other types of houses of greater frontage and larger rooms, to let at higher rentals, have been extensively built.

As regards the provision of baths, it is found that about 15½ per cent of the new houses have been so provided. In all cases separate water-closet accommodation, with a covered dustbin to each house, has been provided, while the whole of the estates have been sewered on the duplicate system.

In respect to sanitary provisions generally, it may be accepted that as regards house drainage, disconnection, ventilation, dampcourse, &c., these have been carried out strictly in accordance with the by-laws and the most modern requirements. . . .

The average accommodation of houses under the several rentals may be taken, generally speaking, to be somewhat as in the following table [see next column].

In the case of houses of a rental, including rates, of over 10s. per week, the rental is, of course, governed by the accommodation provided, and the locality in which the houses are situated. . . .

Notwithstanding the fact that there has been a continuous demand for houses, there has been a serious falling off in the houses erected by private enterprise. . . . The author believes that the primary reasons for this falling off in building appears to be twofold: [illegible] the increased cost of the materials and labour, builders have found it increasingly difficult to build houses which can be sold at a profit, while (2) investors appear to have become reluctant to pay more for the same type of house than was demanded a year or two ago. . . .

The conditions which now prevail in Coventry will, it is feared, render the difficulty more acute, because not only will the work of the Sanitary Committee be made more difficult in dealing with overcrowding and unfit houses, but with a continuance of good trade the increasing scarcity of houses may seriously affect the commercial expansion of the city.

Such a state of things has naturally received full consideration by the governing authority, and it is thought that possibly, under all the existing circumstances, the best and quickest solution will be found by revising the existing by-laws relating to new buildings. It is proposed in this revision to effect two [illegible]

(1) To reduce the height of habitable rooms from 9 ft., as at present, to 8 ft., and to permit rooms in the roof to be 5 ft. 6 in. high at the eaves, and 8 ft. in height over two-thirds of the area.

(2) To dispense with the provision of a disconnecting chamber on the house drains to each house as at present, and to provide that one disconnecting chamber may serve for not more than twelve houses if the length of the common drain does not exceed 300 ft.

The by-laws as regards sanitary and structural provisions will be modernised and extended, but not relaxed. If these modifications are authorised to the extent indicated, it is hoped that the cost of cottage building will be reduced accordingly, and that this may give a fresh impetus to private enterprise in this respect.

Rent, including rates.	Accommodation.	
	Ground floor.	First floor.
5/3 to 5/11 ..	Living room, 12 ft. × 11 ft. 4 in. Scullery, 9 ft. × 9 ft. 6 in. Pantry, coal-cupboard and w.c.	Bedroom 12 ft. × 11 ft. 4 in. ,, 10 ft. × 9 ft. 6 in.
6/- to 6/11 ...	Parlour, 12 ft. × 12 ft. Living room, 12 ft. × 10 ft. 6 in. Scullery, 9 ft. × 9 ft. 6 in. Coal-house, pantry and w.c.	,, 12 ft. × 12 ft. ,, 12 ft. × 10 ft. 6 in.
7/- to 7/11 ...	Parlour, 12 ft. 6 in. × 12 ft. Living room, 12 ft. 6 in. × 11 ft. Scullery, 9 ft. × 8 ft. Pantry, coal-house and w.c.	,, 12 ft. × 12 ft. ,, 12 ft. × 11 ft. ,, 13 ft. × 8 ft.
8/- to 10/- ...	Parlour, 11 ft. 6 in. × 11 ft Living room, 12 ft. × 11 ft. 6 in. Scullery, 12 ft. × 9 ft. Hall, pantry, coal-house and w.c	,, 14 ft. × 11 ft. ,, 12 ft. × 11 ft. 6 in. ,, 12 ft. × 8 ft. Bathroom In some cases no bathrooms are provided, whilst in others there are only two bedrooms and a bathroom.

COVENTRY CORPORATION HOUSING SCHEMES.

The Coventry Corporation have on one estate—viz., Narrow-lane—already erected a considerable number of three and two bedroomed cottages. The scheme for this site, which is now approaching completion, comprises the erection of 180 cottages, 45 of which have two bedrooms, and 135 with three bedrooms. The accommodation provided in the three-bedroomed cottages consists of a living-room, 14 ft. 6 in. by 12 ft. 9 in., scullery-bathroom 9 ft. 7 in. by 8 ft. 9 in., pantry, coals, water-closet, and three bedrooms with an area of 123 ft., 107 ft. and 101 ft. super. respectively. The two-bedroomed cottages are similarly planned, but the frontage is 12 in. less, and in this case the bathroom is arranged on the first floor.

The scheme was commenced in 1908, and has been carried out in sections, the cost per three-bedroom cottage, exclusive of land and street works, varying from £198 to £226, as before mentioned, or including land and street works £226 to £254. The difference in cost between the three and two bedroomed cottages has worked out at about £10 less for the two bedrooms.

The rents charged are 6s. per week for a house with three bedrooms, and 5s. 6d. per week for the two-bedroomed houses, these rents being inclusive of rates. Four shops are also included in this scheme, but these are not yet completed, so that the rents cannot be given.

In addition to the above, twenty-two dwellings on

the dual-flat principle were erected in 1908. These dwellings consist, on the ground floor, of living-room 14 ft. 6 in. by 11 ft., bathroom-scullery 11 ft. by 6 ft. 5 in., [illegible] pantry, water-closet, and one bedroom 11 ft. by 11 ft.; on the first floor the accommodation is similar. The cost of a single tenement was £150, or, including land and sewers, £182, and the rent charged is 4s. 3d., inclusive of rates. The total cost of the above scheme [illegible] have now been issued as regards forty-eight houses in the above scheme and the twenty-two tenements. It is found that at the rents charged the scheme has been self-supporting, including the repayment of sinking fund and interest. It is established in Coventry that a sum equal to 40 per cent of the gross rentals is required for all outgoings, exclusive of sinking fund and interest.

Schemes for the erection of additional dwellings to comply with the Local Government Board requirements in respect to the Leicester-street rehousing, together with additional dwellings, have been approved by the city council, and are awaiting the approval of the Local Government Board. These schemes comprise the erection of 122 cottages known as type "B"; fifty-two two-bedroomed tenements, and twenty-four one-bedroomed tenements, both the latter being on the dual-flat principle. The cost of these schemes is estimated at £40,280.

The houses to be demolished in the Leicester-street improvement scheme consist of very poor-class dwellings occupied by poor people. The rents paid for the existing houses vary between 1s. 6d. to 6s. per week, but 68 per cent of the houses are let at 4s. and under per week. To meet a question of this nature, and to provide houses for the poorest, raises at once the real crux of the housing problem. The author has endeavoured to keep this object in view so far as is practically possible, in the dwellings it is proposed to erect. To accomplish this it has been assumed that the suggested alteration in the building by-laws will be sanctioned, and the plans are prepared on this basis.

The estimated cost of the several types of dwellings proposed to be erected is:—

Cottage (type B), £185; with land, streets and sewers, £214 each; two-bedroomed tenements, £150 each; with land, streets and sewers, £184 each; one-bedroom tenements, £125 each; with land, streets and sewers, £158 each.

The rentals necessary to make this scheme self-supporting, including repayment of sinking fund and interest, will require to be: Cottages, 5s. 9d. per week; two-bedroomed tenements, 5s. per week; and one-bedroomed tenement, 4s. 3d. per week.

If the sinking fund were entirely omitted it would be possible to reduce these rents by 6·8d., 5·7d., and 4·8d. per week, for each type of dwelling respectively. The scheme, on the basis of five persons per three-bedroomed house, four persons per two-bedroomed tenement, and two persons per one-bedroomed tenement, which is the basis laid down by the Local Government Board, will accommodate 866 persons.

In addition to the above the author has prepared a further scheme which is at present under consideration for the erection of 118 cottages, type "A": Estimated cost, exclusive of site, &c., £184; 106 tenements with two bedrooms, estimated cost, exclusive of sites, &c., £154; and 34 tenements with one bedroom, estimated cost, exclusive of site, &c., £126, both the latter being on the dual-flat principle. The total estimated cost of this scheme, including land, &c., and buildings, is £54,000. The rentals necessary to make this scheme self-supporting, including repayment of sinking fund and interest, will require to be: Cottages, 6s. 6d. per week; two-bedroomed tenements, 5s. 7d. per week; and one-bedroomed tenement, 4s. 9d. per week. If the sinking fund is omitted, it would be possible to reduce these rents by 10d., 7d. and 6d. per week for each class of dwelling respectively. . . .

The Housing Committee do not seek to make a profit on the housing schemes, but it is insisted that these shall be self-supporting.

PROVISION OF OPEN SPACES.

The greatest development of new estates has taken place in the north, east, and south-west of the city, and these localities are within easy reach of one or more open spaces. Notwithstanding this, the corporation has recognised that other districts were not so well served in this respect. In recent years additional open spaces and recreation grounds have been secured, and these have been laid out by the author. . . .

TRAFFIC ON CENTRAL STREETS.

A few years ago the streets were reasonably sufficient for the traffic conditions, but in recent times such is the increased volume of traffic that at least nine of the most important business streets have become more or less congested. This is a difficulty which every year is becoming more acute, so much so that it is forcing itself upon the serious consideration of the authority. . . .

It is decided that a combination of street widening and the opening out of new streets is the correct solution. . . . The whole question of street improvement is being considered comprehensively by the corporation, and several important schemes and estimates of cost, &c., for new lines of streets and street widenings prepared by the author are now under consideration. . . .

OTHER MUNICIPAL ENTERPRISES.

The special works upon which the author has been engaged in this connection comprise: Extension of electricity works; extension of the sewerage system; resewering of districts; surface-water system of sewers; extension of sewage disposal works; refuse destructor; hospital extensions; new mortuary; fire stations; new general works depot; new streets, widenings, and improvements; additions to baths; new slipper baths to outside district; three branch libraries; three new road bridges, &c.

In addition to these, many other works of importance are in hand by the author, including two new covered service reservoirs; reconstruction of city system of sewers; 2 acres of bacteria beds at the sewage farm; underground conveniences; new thoroughfares in centre of city, street widenings; two new swimming baths; housing schemes; and a great number and variety of other less important work consequent upon the increased public needs. The increase and nature of the traffic upon the streets at the present time also demand greater expenditure and new methods of construction. In addition to the foregoing, the corporation have in recent years built new gasworks, secured an additional water supply, and are at present erecting new municipal buildings, while six new schools have been built, and others are contemplated, including a new technical institute.

AREAS TO BE TOWN PLANNED.

The very great desirability of embracing the whole of the undeveloped land in the city in town planning schemes is very prominent in the view of the governing authorities. The author has recommended that an area of 976 acres shall be included in the first application, and the city council has authorised this to be done. It is the intention forthwith to embrace the whole of the remaining undeveloped areas within the city boundary, and such further adjoining areas as are deemed advisable in a comprehensive town planning scheme.

There are two estates, comprising a total area of 35 acres, being laid out on town planning lines in this city, and in connection with these the corporation have devoted much time to the formulation of certain provisions which it is intended shall form the basis of their town planning schemes on a wide scale. These provisions will provide that on areas where the number of houses does not exceed fifteen to the gross acre, subject to certain conditions, the widths of non-traffic roads may be reduced to not less than 24 ft. in width, and, further, it is intended to give more latitude with reference to the construction of such roads. In such lay outs building lines will be required to be set back at least 35 ft. from the centre of the roads.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for October is awarded to

Mr. P. HARRISON,
Hazle Dene,
Sadler-street,
Middleton, Lancs.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

433. Mechanics.—Show how to find the periodic time of one complete vibration in a case of simple harmonic motion, and give a proof of the necessary formula.

435. Damp Prevention.—Show by sketches three methods of preventing moisture in the soil from rising into a brick wall: (*a*) an ordinary 14-in. wall, (*b*) a 16-in. cavity wall, (*c*) an 18-in. basement wall.

436. Ventilation.—What effect has (*a*) the breathing of animals and (*b*) the combustion of fuel upon the purity of the atmosphere? (T. R.)

437. Underpinning.—A carved column in a church is showing signs of settlement. Describe, with sketches, the method of timbering and underpinning it. (L. C. B., *Clevedon.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

432. Ventilation.—What is the distinction between "natural" and "artificial" ventilation?

By natural ventilation is understood the movement of the air through a room due to the different densities of the air within and that without. By artificial ventilation is meant the application of some force or forces either to force in fresh air (the plenum system) or to expel the foul air (the vacuum system). *Natural Ventilation.*—As the air within is always warmer, more or less, and has a tendency to rise, it is desirable that the movement should be effected without causing unpleasant draughts. To admit of this, the cubic space per head for each occupant should not be less than 1,000 cub. ft., permitting an entire change of the air of the room not less than three times an hour. An inlet of 24 sq. in. clear area and outlets to the same amount are required for each person. The inlets should be above the heads of the occupants, and not nearer the ceiling than can be avoided. They should be so constructed as to direct the incoming air upwards, and should be fitted with valves so that when, in consequence of great differences of temperature, there is a much increased current of air, its volume may be reduced by reducing the area of the inlets. Inlets may with convenience be placed so as to admit air from a passage or corridor, when it will be somewhat warmer than the outer air and nearly as pure, and the tendency to unpleasant draughts will be reduced. Outlets should be in or as near to the ceiling as possible. *Artificial Ventilation.*—With this system, as above stated, the air is propelled from or drawn into the room at a comparatively high velocity. (W. D., *Dudley.*)

434. A Question in Statics.—A light rod, of length 3 ft., whose weight is neglected, has equal weights attached to it, one at 9 in. from one end and the other at 15 in. from the other end. If it be supported by two vertical strings attached to its ends, and if the strings cannot support a tension greater than the weight of 1 cwt., what is the greatest magnitude of the equal weights? (H. P. M., *Towyn.*)

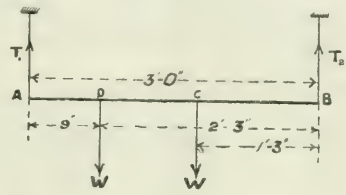
[This question is ambiguous, and correspondents have interpreted it in two ways—viz., the maximum tension of *each* string being 1 cwt., and the maximum tension of *both* strings being 1 cwt. An example of each solution follows.—Ed.]

Fig. 1 shows the arrangement and disposition of the forces acting. AB represents the light rod.

Let T_1 and T_2 = Tensions in the vertical supporting strings, the magnitude of each of which is not to exceed the weight of 1 cwt.,

and let W = Each of the two equal weights.

We wish to evaluate W.



From an inspection of the figure it will readily be seen that, since equilibrium obtains, the upward forces exactly counterbalance the downward forces *i.e.*,

$$T_1 + T_2 = 2W \quad . \quad . \quad . \quad . \quad . \quad (1)$$

It will also be abundantly clear that, since the weights are of equal magnitude, and that the tension string T_1 is nearer the weight W (9 in. away) than the tension string T_2 from the other weight W (15 in. away), and since there are no other forces acting, the magnitude of T_1 must necessarily be greater than the magnitude of T_2. But we are given that the maximum weight each string can support is 1 cwt.; hence the maximum value of T_1 is 1 cwt., and of T_2 is less than 1 cwt.

Now, taking moments about the end B of the rod, and paying proper attention to sign, gives:—

$$T_1 \times AB = W \times DB + W \times CB$$

$$i.e., \; T_1 \times 3^1 = W \times \frac{9^1}{4} + W \times \frac{5^1}{4}$$

$$\therefore \; 3T_1 = \frac{9W}{4} + \frac{5W}{4}$$

$$\therefore \; 12T_1 = 9W + 5W = 14W$$

$$i.e., \; T_1 = \frac{14}{12} W$$

$$\text{or } W = \frac{6}{7} T_1$$

But the maximum value of T_1 is 1 cwt.

$\therefore$ The maximum value of $W = \frac{6}{7}$ cwt.

Hence, the maximum value of each weight is $\frac{6}{7}$ cwt.

It is interesting to note from equation (1) that :—

$$T_1 + T_2 = 2 \cdot \frac{6}{7} = \frac{12}{7} \text{ cwt.}$$

$$i.e., \; 1 + T_2 = \frac{12}{7} \text{ cwt.}$$

$$i.e., \; T_2 = \frac{5}{7} \text{ cwt.}$$

Therefore the right-hand supporting string need be only $\frac{5}{7}$ the sectional area of the left-hand supporting string, provided it is made of precisely the same material, and can therefore withstand the

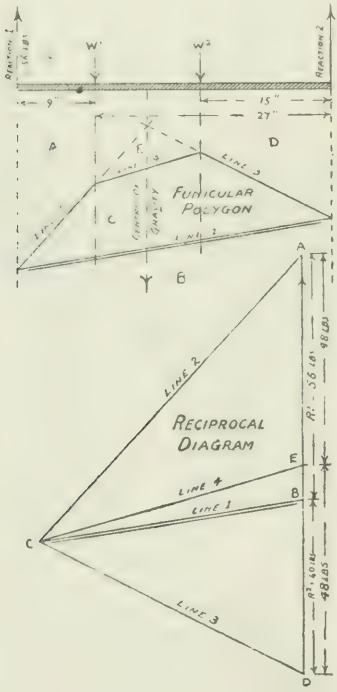
[illegible] $W = \frac{5}{3} T_1$ [illegible] T_1 = maximum [illegible] T_1 [illegible] T_1 [illegible] and therefore, since T_1 was the only value, we could assume it became essential to take moments about the end B. The choice of the maximum value for the correct tension string, and the choice of ends about which to take moments are the sources of [illegible] of W. P., [illegible]

The weight of the rod being neglected, the the greatest weight which may safely be applied at the centre is 1 cwt. (112 lb.). It is therefore [illegible] weight of 56 lb., and the two weights which are to be placed on the rod must not cause a greater strain than that amount on either of the two strings, or the maximum reaction will be overcome and the string will break. If the rod be drawn to scale, and the points of application of the equal weights marked on it, the centre of gravity can be found, being half way between the two weights. The string which is situated nearest to the centre of gravity will be subject to the greatest strain, and to obtain the greatest magnitude of the equal weights this strain must be taken at 56 lb., which equals the maximum reaction of the string.

The formula for ascertaining the reaction of the weights is:—

$$R_1 = \frac{W^1 \cdot D + W^2 \cdot d}{L}$$

W^1 and W^2 weights D and d distances from respective weights to the opposite support,



and L = total length. But R_1 is known, and the weights are not known, therefore the formula will have to be reversed—

$$W_1 + W_2 = \frac{R_1 + R_1}{D + d} \times L \text{ or } W_1 + W_2 = \frac{56 + 56}{27 + 15} \times 36$$

= 96 lb. As the weights are equal 96 ÷ 2 = 48 lb, therefore 48 lb. is the magnitude of each of the weights.

To prove this take the first formula and substitute the figures—

$$R_1 = \frac{(48 \times 27) + (48 \times 15)}{36} = 56 \text{ lb. Reaction 1}$$

To find the reaction 2 substitute for distances 9 in. and 21 in., and it will be found that the reaction is 40 lb. on the other string.

To work the problem graphically, which is much more simple, draw the AB to represent reaction 1 [illegible] drawn on reciprocal diagram. Take any point C and join AC and BC.

Draw the line 1 on the original diagram and parallel to BC, and project the lines downwards from the end of the rod, giving the terminations of line 1. From one end of this line draw line 2 parallel to AC on reciprocal diagram until it cuts the line of the centre of gravity. From this point draw line 3 and complete the funicular polygon by line 4, drawn from the point of intersection of line 2 and weight 1 projected to the intersection of line 3 and weight 2 projected. Transfer lines 3 and 4 to the reciprocal diagram, shown by CE and CD. Letter the spaces on the original diagram, and it will be found by scaling off the line AE on the reciprocal diagram that the weight 1 = 48 lb. It will also be found that weight 2 = 48 lb.; and the reaction 2 is shown to be 40 lb. The mathematical method is seen to agree with the graphical method, proving the accuracy of the result. (P. H., *Middlesex.*)

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Do we not all deeply regret the death of Mr. W. B. Bryan, the chief engineer of the Metropolitan Water Board, and shall we not all reverence the memory of a man who did so much to improve the water supply of London, not only as engineer to the Water Board, but also as engineer to the East London Waterworks Company? Cannot those of us who recollect the condition of that company before Mr. Bryan took office say with truth that he was a public benefactor as well as a great engineer?

* * * *

Is it not excellent reading to see in the last issue of the Royal Automobile Club *Journal* the result of the War Office and Admiralty appeal to members of this club to place themselves and their cars at the disposal of their country? Is it not remarkable that, at a few hours' notice, the club was able to supply no fewer than eighty-seven motor cars for various purpose? Who can say now that motorists are selfish people?

* * * *

What are local surveyors and building inspectors doing to ascertain if there are any concrete floors, suitable as platforms for heavy guns, existing in this country, and what steps are they taking to inform the proper authorities?

* * * *

Is it a fact that in planning warehouses, hospitals, and public institutions of all kinds, architects and engineers are now designing and carrying out on a large scale installations by which the whole of the interior can be periodically cleaned by means of the vacuum process, and is not this a very considerable advance in "domestic" sanitation?

* * * *

What do surveyors think of the reproof administered by the Special Committee of the Institution of Civil Engineers on Practical Training of Engineers to those municipal authorities who by their short-sighted policy prevent their surveyors from taking premium pupils?

* * * *

What is the evident inference to be drawn from the statement that during the past twenty-five years the Germans have so designed and erected all their public schools that they could be made available at any time to serve as military hospitals? Why should this precaution have been taken in a country which desired to live at peace with its neighbours?

* * * *

When will the question of the liability for extraordinary traffic become less of a legal tangle than it is at present? Would it not have been supposed that after all the numerous cases that have gone through the law courts there would have been sufficient judgments given to guide in some measure the necessary procedure and clear the ground for fights on a straight issue?

The Surveyor

And Municipal and County Engineer.

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Have any of the magnificent boulevards laid out by Mr. Brodie in Liverpool been named after him? Or is it a fact that these boulevards or avenues are called almost exclusively after the names of members of the corporation?

* * * *

Would it not be very useful if the Road Board could now issue some report on the best method of dealing with the surface of roads subject to heavy, medium, and light traffic? Should not the experience now gained by their officers enable them to issue even a tentative report on this subject? Is it not possible that there may be some highway engineers who are so wedded to some particular form of road construction that they cannot be induced to try some other and perhaps better and more economical method?

* * * *

Is the war responsible for occasional lapses of memory? Otherwise how can it be accounted for that in the last issue of "Things One Would Like to Know" your contributor referred to the non-issue of the "Standard Specification for Road Stones," when it had already been issued?

THE TRAINING OF MUNICIPAL ENGINEERS.

Invited to express his opinion as to the views set out in a letter on this subject which appeared in The Surveyor of last week (p. 524), Mr. John S. Brodie, borough engineer and surveyor of Blackpool, writes:

"I have to say that I entirely agree with the evidence given by Mr. S. S. Platt and Mr. J. A. Brodie before the Special Committee of the Institution of Civil Engineers on behalf of the Municipal Engineers' Section of the institution. My system of taking pupils has been practically the same as theirs, and the conditions that pupils shall not only matriculate, but must use their best endeavours to graduate in an engineering college has resulted in my having had comparatively few pupils. But then, I think, this is a case where 'quality is much better than quantity.'"

Other letters on this subject, received yesterday, will appear next week.

Society of Architects.—Mr. E. C. P. Monson, F.R.I.B.A., will deliver his inaugural address as president at the opening meeting of the session on Thursday next, the 12th inst. The chair will be taken at 7.30 p.m.

PRO PATRIA.

[NINTH LIST.]

We present herewith a ninth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Cheetham, Dr. W. H., medical officer of health, North Riding of Yorkshire, Yorkshire Hussars.

Coales, H. W. (son of Mr. Herbert G. Coles, Assoc.M.Inst.C.E., engineer and surveyor to the Market Harborough Urban District Council), engineering assistant, Birmingham, Tame and Rea District Drainage Board, 5th Battalion Leicestershire Regiment (Territorials), under orders for the front with the North Midland Brigade.

Davies, A. T., V.D., county surveyor of Salop, Major, 4th King's Shropshire Light Infantry.

Dent, Neil, assistant, borough engineer's department, Nelson, Royal Naval Division, Oxney Bottom Camp, Ringwould.

Duesbury, P. E., assistant borough surveyor's department, Derby, North Midland Field Artillery.

Hall, H., county surveyor's department, North Riding of Yorkshire, 4th (Reserve) Battalion, Yorkshire Regiment.

Norster, T., engineer-in-charge, County Hall, Northallerton, Royal Navy chief engine-room artificer, H.M.S. *Hermione*.

Oliver, T. V., assistant, engineer and surveyor's department, Tamworth Rural District Council, Royal Engineers.

Warr, G. W., surveyor to the Steyning East Rural District Council, National Reserve.

Whitby, John A., assistant surveyor to the Lower Bebington Urban District Council, Cheshire Company, Royal Engineers (Territorials).

Mr. Beloe, of the British Westrumite Asphalt Company, Limited, has joined the Royal Engineers, for active service.

Mr. Albert Lowrie, assistant secretary, Roads Improvement Association, is serving with the 1st City of London, Army Service Corps.

The November issue of the *Journal* of the Royal Sanitary Institute contains a long list of Fellows, members and associates of that body in His Majesty's Forces.

Mr. Reginald Ryves, Assoc.M.Inst.C.E., has been given a commission in the First London Divisional Engineers. Although only just over forty years of age, Mr. Ryves has had a wide and varied engineering experience, which commenced in the office of a well-known railway engineer. From railway work he transferred his attentions to water engineering, and was for some time engineer-manager to the Cartagena Waterworks Company. Two years after leaving Spain he was appointed Acting Professor of Civil Engineering at the Government Engineering College, Madras, and filled other important posts in the Public Works Department before returning to England, owing to ill-health, in 1910. Since that date his many contributions on the subject of roads have made his name a familiar one to the readers of this journal.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in The Surveyor and Municipal and County Engineer, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News*, New York.

* By Reginald Ryves, Assoc.M.Inst.C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

Law Notes.

Edited by J. B. REIGNER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, on one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address. Correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK INK only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion queries are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

Overflowing Cesspool.—"W. F. Y. M." writes: I have a public house and a block of four cottages, all drained into a common cesspool. The public-house is owned by a firm of brewers and the cottages by another owner. The cesspool has an overflow into a pond. The existing conditions have been in operation over twenty years. The whole of the drains and cesspool were put down and have been maintained by the owners. The owner of the field calls upon the local authority to abate the nuisance of an overflow discharging into the pond. Please say are the authority (urban district council) liable for the drains or cesspool or overflow?

In my opinion the drain is a "sewer" vested in the council from the point at which it is joined by the drain from the cottages. See *Pearce* v. *Bateman*, 59, 51 J.P., 278. I think the overflow pipe is a continuation of the "sewer," and as the cesspool appears to be more or less of a catchpit, it is probably part of the sewer, also. (See *Attorney-General* v. *Dedworth Rural District Council*, 67 J.P., 448.) The council are bound to provide the necessary outfall for the sewer. See *Rogers* v. *Tynemouth Rural District Council*, 1896, 2 Q.B., 431. Their statutory powers give them no right to discharge unpurified sewage into the pond (see sec. 17 of the Public Health Act, 1875), but inasmuch as the existing conditions have been in operation over twenty years, the council may have acquired a prescriptive right to do so. Such a right, however, could only have been acquired by the continuance of a perceptible amount of injury for twenty years; and no prescriptive right can be acquired to create a *public* nuisance. Unless the council are in a position to prove a prescriptive right they must provide some other outfall for the sewer.

Private Street Works Act, 1892. Non-service of Owner.—"Verax" writes: My council, carrying out street works under this Act, duly served notices, under sec. 6, upon the reputed owners. No objections were received. The work was completed, and the actual costs prepared and duly served. The street consisted of four corner blocks built on and fenced in, and two open middle strips, each of, say, 120 ft. The owner A of one of the open strips, on receiving his apportionment, called and stated that he was not the owner of the whole 120 ft., but that he had sold a narrow strip 6 ft. wide as a right of way some years previously to B. What is our position, as no notice under sec. 6 has been served on B? Can it be said that A is the reputed owner?

Unless a copy of the resolution to do the works has been served upon the true owner of premises within seven days after the date of the first publication thereof, the authority cannot recover the apportioned expenses (*Wirral Rural District Council* v. *Gardner*, 1903, 1 K.B., 646; *Maguire* v. *Liverpool Corporation*, *Garston District Council*, 76 J.P., 479). Assuming therefore that B, and not A, was the true owner of the 6-ft. strip at the time of the service upon A, the expenses chargeable to the strip are irrecoverable. But if A merely granted B a right of way over the strip, and not the strip itself, A would still be the true owner, and the service on him would be good. No doubt he was the reputed owner, but that would not avail unless he was also the true owner. I assume that the 6-ft. strip adjoins the road.

Road Widening: Electricity Supply.—"J. J." writes: My Highways Committee have recently pulled down a shop which has been in their possession for many years for the purpose of widening a public highway in the town. Before the shop was pulled down the electricity department of the corporation, at the request of the Highways Committee, took out the service from their main to the shop, which was put in at the request of the tenant, but without the consent of the Highways Committee being asked for. The electricity department has now sent an account for the cost of taking out the service, and I shall be obliged if you will advise if the Electricity Committee can legally demand the cost of this work.

The only provision in the Electric Lighting Acts as to the cost of cutting off a supply of electricity appears to be sec. 22 of the Act of 1882, which applies where charges are in arrear. This section is obviously not applicable to the present case, the service having been removed at the request of the owners, and not on account of the non-payment of charges. There may, however, be some clause in the Provisional Order under which these expenses can be recovered, or it may be that the request by the Highways Committee would be construed as implying an agreement to pay the expenses. On the information supplied the point is a doubtful one.

Private Street Works.—"W. A. C." writes: A has a strip of land about 4 ft. wide, and extending the full width of a street which is a cul-de-sac. My council having previously made up this street under the Private Street Works Act, 1892, and the final apportionment having been served on the reputed owners, and the apportionment based on frontage, am I right in including the full width of street, or should I have taken between the kerbs and charged him for making up the carriageway only, or should he be charged on a degree of benefit? I might say that the land on the other side of a stream beyond is in different ownership, and no doubt this piece of land has been reserved in case the other owner should require an outlet at any time.

Assuming that the full width of the street has been made up, I see no reason why A's frontage should not be measured for the full width. He cannot be charged on the "benefit" principle unless a resolution has been passed under sec. 10 of the Act.

Highway: Roller Depot.—"L. C." writes: A rural district council is desirous of renting land for the purpose of a roller depot and yard for the storage of road materials, &c. The council referred to succeeded the old Highway Board in 1894. Under the circumstances, would the renting of the necessary land for a depot be a legal charge on the whole district, and could it be made without a special application being made to the Local Government Board for urban powers?

By sec. 29 of the Local Government Act, 1894, "highway expenses" incurred by the council of a rural district are to be defrayed as "general expenses," payable out of the common fund, with the option to the council (with the approval of the county council), under special circumstances, to charge contributory places separately. "Highway expenses" would appear to include everything incidental to the repair of highways and keeping them in proper condition. (See Pratt and Mackenzie's "Law of Highways," 15th edition, p. 176, note (b)). Whether the provision of a place for the storage of a roller and road materials is incidental to the maintenance of the highways would probably depend upon the circumstances of the particular case. In the event of the expense being disallowed by the auditor an appeal would lie either to the King's Bench Division by *certiorari* or to the Local Government Board.

A BOROUGH COUNCIL'S APPEAL.

NEW TRIAL ORDERED IN BATTERSEA CASE.

The Court of Appeal, yesterday, after a hearing lasting nearly four days, ordered a new trial of the action brought by Miss Papworth, formerly manageress of a confectioner's shop, against the Battersea Borough Council, who were ordered by the lower court to pay damages amounting to £1,961 for personal injuries sustained by plaintiff.

The action was tried before Mr. Justice Horridge and a common jury. Miss Papworth, in January last year, was cycling when, as she alleged, she went over a sewer gully which was in a dangerous state. She was thrown from her machine, and a motor car ran over her, inflicting such injuries that she was disabled permanently from following her occupation. It was contended for the council that in any event they could not be guilty of anything beyond nonfeasance, which was insufficient to render them liable in law; also that liability for non-feasance was only to the community as distinct from the individual, unless such liability was directly imposed by the language of the statute. Mr. Justice Horridge held that the defendants were liable as the sewer authority for not having remedied the defect in the gully.

Yesterday the Appeal Court held that there had been such non-direction by the Judge as to amount to misdirection, and that the damages were excessive. The Court refused, however, to reverse the decision of the Court below, but, as stated, ordered a new trial.

Institution of Municipal Engineers.

EASTERN AND NORTH-EASTERN DISTRICT MEETING AT LINCOLN.

Institution of Municipal Engineers at Lincoln.

A highly successful district meeting of the Eastern and North-Eastern Districts of the Institution of Municipal Engineers was held at Lincoln on Saturday last, the 31st ult. There was an excellent attendance of members and visitors, among those present being the Mayor of Lincoln (Councillor H. E. Newsum), Mr. A. Harrison (chairman, Welton Rural District Council), Rev. S. Wild (vice-chairman, Welton Rural District Council), and Mr. H. B. Kirkley (chairman, Lincoln Board of Guardians), Messrs. Horace Boot (president of the institution), W. C. Brackenridge (Spilsby Rural District Council), T. F. Hewitt (Lincoln), W. Starkie (Welton Rural District Council), J. E. Bolt (Spilsby Rural District Council), H. W. Coulson (Lincoln), C. A. Howard (Brigg Rural District Council), G. E. Mathews (Spalding), A. W. M. Gilbert (Welton Rural District Council), J. H. Holmes (Horncastle Rural District Council), T. R. Howitt (Branston Rural District Council) W. W. Walker (Alford Urban District Council), A. Applewhite (Lincoln), N. E. D. Dixon (Oundle Rural District Council), C. Horobin (waterworks engineer, Lincoln), J. K. Crawshaw (Lincoln), A. Harford Stevens (Blaby Rural District Council), R. A. MacBrair (city surveyor, Lincoln), Stanley Clegg (electrical engineer, Lincoln), G. Belson Chilvers (hon. district secretary) and B. Wyand (secretary of the institution).

An attractive programme had been arranged by Mr. G. Belson Chilvers, the hon. district secretary, the proceedings including a short business meeting, a reception by the Mayor of Lincoln (Mr. H. E. Newsum), luncheon, and an inspection of the city undertakings; the only drawback to a thoroughly satisfactory day was the rain, which fell rather persistently, and not only made the conditions somewhat uncomfortable, but veiled the beauties of the cathedral city in a disappointing way.

At the business meeting at the Guildhall it was decided to recommend that steps should be taken to prepare a roll of honour of those members of the institution who are serving their country with His Majesty's Forces, and that it should be placed in the council chamber of the institution. Members were also recommended to purchase the members' identification badge, which, it was pointed out, greatly facilitated mutual resognition at district and other meetings.

The Mayor, on arrival, was offered a hearty welcome on behalf of the institution by Mr. Horace L. P. Boot, M.I.E.E., M.I.MECH.E., the president, who said the members desired to thank his Worship for being present to receive them to that ancient city. His presence there was an honour to the institution and to every individual member.

The Mayor, on rising to address the company, was warmly cheered. When he received their invitation, he said, he was glad to accept it, and to have an opportunity of offering them a hearty welcome to the city, because it was only right that he should do so seeing that they, as amateur members of the corporation, knew only too well what a debt they owed to their officers. Anyone who held an office such as his was brought more closely into touch with the working of the corporation, and that had only one result—to make him realise that members of public bodies would discharge their duties very badly indeed were it not for the assistance they received. They claimed in Lincoln that their undertakings were in every respect quite up to date. They were not so large, perhaps, as some with which those present might be acquainted, but for their size he believed they would well repay the trouble of inspection. It was with the utmost pleasure that he welcomed them to the city, and he trusted that their stay, though short, would be pleasant and profitable.

The President (Mr. Boot), who had been unable to attend the business meeting, followed with a short address to the members. It was only left for him, he said, to offer a few words of welcome to the various chairmen and vice-chairmen of the district councils who were present, and more particularly to the chairman and vice-chairman of the Welton District Council. They, as municipal officers, appreciated very much the honour those gentlemen had shown to them in coming to their meetings. As municipal officers they were paid for their services, but these gentlemen were giving their services free. It was for the love of seeing order maintained, and having good things carried out for the benefit of citizenship. Speaking of the response made by the members of the institution to the call of King and Country, Mr. Boot said that, in these times when the unfortunate subject of war was on their minds it might interest them to know that their members had rallied magnificently in answer to the country's call. A corps had been formed for the purpose of looking after water supplies, analysing the water and seeing that the sanitary conditions of their soldiers were good. A circular letter was sent to their members inviting them to join, and the response had been so great from the institution that the officer commanding had to send out a number of postcards to members informing them that the corps was at full strength. Whatever else the institution could be criticised for, it was at least a loyal body. In conversation with Captain A. J. Martin, he had asked if he could not approach the War Office and try to induce them to form another corps, so that those who were unable to obtain a place in the first corps might have a further opportunity of enlisting. The fine response that had been made went to show that our good old country was not going to the dogs, as some people seemed to think.

THE VISITS.

After lunch at the Great Northern Hotel, the party proceeded on the round of visits which had been arranged to the municipal works of the city. Unfortunately, the preliminary to this, viz., the visit to the objects of antiquarian interest, with which the city abounds—took longer than was contemplated, and resulted in a considerable cutting of the original programme. Mr. T. Francis Hewitt (member), of the

[illegible] disposal works have been kindly supplied by Mr. R. A. MacBrair, M.INST.C.E., the city engineer and surveyor:

[illegible] SEWAGE DISPOSAL WORKS.

The population sewered is about 68,000.

All the sewage gravitates to the pumping station, and is then lifted some 60 ft. to the farm, ¾ mile distant.

The daily quantity of sewage is about 2,000,000 gallons, sometimes less in dry weather. In heavy rain it rises to 6,000,000 gallons, and pumping takes place continuously.

The tank accommodation is about 2,200,000 gallons; sewage is allowed to rest some ten or twelve hours, and is then run off on to bacteria beds during the night.

There are ten primary bacteria beds and five secondary sprinkling filters. When the bacteria beds were first constructed they were on the contact system. During the last few years the secondary ones have been converted into filter-beds by fixing revolving sprinklers. A commencement has been made so to convert the primary beds, and at the present time one of these is in hand, besides the construction [illegible] primary beds, and 1 acre of sprinkling filters. The sizes of the sprinklers vary from 48 to 95 ft. The makers are W. E. Farrer, Limited, Ham, Baker & Co., Adams-Hydraulics, and the Carlton Engineering Company.

The area of the farm is 96 acres, of which 30 acres consist of roads, tanks, filters, buildings, and sludge lagoons, there being about 14 acres of the last named. The farm is used for sewage which is too thin to go with the sludge, and too thick to go to the filters; again, it is used in flood time.

The nett annual cost at the sewage pumping station, including flushing of sewers, is about £1,200, the cost of digging in the sludge £450, and the loss upon the farm (according to the seasons) about £500.

Next week the refuse destructor adjoining the sewage pumping station is to be opened. The steam generated from the refuse destructor will be utilised in pumping the sewage; the annual coal bill is from £800 to £1,000, which will be saved. The destructor is of the latest type, and is being erected by Messrs. Heenan & Froude, Limited, Manchester.

COUNCIL MEETING.

At a meeting of the council held in London on October 28th the following applicants were recommended for admission: To Membership—Messrs. E. J. Holland, city engineer, Guelph, Ontario; F. E. Reynolds, highway surveyor, Buckingham Rural District Council; and W. W. Walker, surveyor, Alford Urban District Council.

From the applicants recommended for admission at the last meeting eight members and two associate members were elected, and one transfer was made to membership and one to associate membership.

A letter from the Builders' Merchants' Alliance was read as regards uniformity of tenders in the case of sanitary pipes, and it was resolved that an interview with representatives of the alliance be arranged to discuss the matter.

The next meeting of the council will be held in London on November 25th.

Street Paving in Japanese Cities.—Modern street paving is as yet practically unknown throughout Japan. The usual Japanese street has no footway, and no attempts have been made to provide separate roadways for pedestrians outside the business districts of the more important cities. These streets have no artificial pavings, they are usually macadamised in as cheap a way as possible, and are in bad condition at all times of the year in the congested traffic districts. In the city of Tokyo, where there is a population of some 2,000,000, there is only one steam roller employed on these pavings, and that is usually out of order. In Yokohama a few of the business streets have cement footways, but none of the streets are paved. Yokohama has a population of about 400,000, and a street mileage about equal to that of any city of like population.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bispham U.D.C. (October 27th. Mr. M. K. North).—£12,000 for private street improvement in Queen's-drive and Red Bank-road.—It was stated that other streets had been scheduled in the resolutions passed by the council. Queen's-drive was a road running two-thirds the entire length of the district, and was really a continuation of the Blackpool [illegible] and was used by a great deal of traffic. Red Bank-road was only used as an approach to and from the sea front, but there was a good deal of traffic on it.

Croydon T.C. (October 20th. Mr. R. H. Bicknell).—£60,131 for works of street improvement, and £1,800 for works of surface-water drainage in the Pollards Hill district of the borough.—The details were explained by the borough engineer, Mr. G. F. Carter, and there was no opposition.

Dewsbury T.C. (November 3rd. Major C. E. Norton).—£3,200 for sewerage purposes for a portion of the Thornhill district.—The town clerk, Mr. H. Ellis, said the question of draining the district had been before the Thornhill District Council some years before amalgamation with Dewsbury took place, but nothing could be done until the sewage works at Smithy Brook had been extended. The borough surveyor, Mr. H. Dearden, gave evidence in explanation of the scheme.

Lewes T.C. (November 3rd. Mr. R. G. Hetherington).—£22,384 for the completion of the drainage scheme.—It was stated that sanction for a loan of £27,455 was obtained in 1911. There now remained to be carried out the drainage of the part of the town lying to the north of the High-street—the coupling up and connecting with the new system of the drainage of the Cliffe and the Wallands. Those districts were efficiently drained; the only thing needed to be done was the connecting with the new system.

Nantwich U.D.C. (November 3rd. Mr. A. W. Brightmore).—£17,000 for works of sewage disposal.—Opposition was offered on behalf of the Joint Hospital Board, whose hospital adjoins the site, and by private owners.—Mr. Baldwin Latham, the consulting engineer, said in reply that the hospitals at Croydon and Wimbledon were practically built on sewage farms, and there were no two hospitals in the country which were more successful in their treatment of cases.

Redruth R.D.C. (October 20th. Mr. R. G. Hetherington).—£4,250 for a water supply for the parish of Gwennap.—The engineer, Mr. N. Trestrail, said it was proposed to take the water from a source at Treskerby Moor, and pump it to a reservoir at Highway capable of holding 66,000 gallons. The pumping station would be at Treskerby Moor. The scheme would practically include Scorrier, Highway, Vogue, Treskerby, St. Day township, Tolgullow, Crofthandy, Little Beside, Berwithen, and Tolcarne. Twelve gallons per head would be allowed. The capacity of the pumps was 45 gallons per minute, or 2,700 gallons per hour. It was proposed to put a standpipe within 200 ft. of the houses on the line of the main.

Sedbergh R.D.C. (October 27th. Mr. Courtenay Clifton).—£3,200 for the erection of twelve cottages at Guldrey, and three at Saltpie, Millthrop, near Sedbergh.—In order to meet existing and immediate requirements, the council have bought an acre of land at Guldrey for £150, and about 1,000 sq. yds. at Saltpie, Millthrop, for £37 10s. The clerk estimated the income at £150 per year. The inspector said he would be obliged to recommend to the Local Government Board that more land should be bought at Saltpie, or that only two cottages should be built, as there was not enough ground for suitable gardens, which was important to a working man. In another part of England it had been proved that a garden was equal to 1s. 4d. a week, which was a nice help towards the rent.

Stanley U.D.C. (November 3rd. Mr. Edgar Dudley).—£3,000 for the provision of a public park.—It was stated that the scheme would give employment to many men now out of work.

APPLICATIONS FOR LOANS.

Barnstaple T.C.—£[illegible] for a roller and engine shed.

Barrow T.C.—£13,000 for [illegible] extensions.

Batley T.C.—£6,500 for new electricity undertaking.

Beckenham U.D.C.—£350 for culverting.

Bradford T.C.—£52,000 for new electricity mains and transformer chambers.

Bridlington T.C.—£300 for the purchase of land for a new street.

Brighton T.C.—£385 for the purchase of property for street improvement.

Bury T.C.—£1,500 for road improvement.

Cirencester U.D.C.—£1,150 for the purchase of land for street widening.

Egham U.D.C.—£1,090 for road improvement.

Holme Cultram U.D.C.—£1,200 in connection with Silloth sea wall.

Horsham U.D.C.—£3,000 for an isolation hospital.

Hythe T.C.—£1,000 for laying out the playing fields.

Ilfracombe U.D.C.—£630 for making up High-street with tar macadam, and £350 for the purchase of property.

Llandudno U.D.C.—£1,500 for water main extension.

Loughborough T.C.—£5,806 for a new fire station.

Middleton T.C.—£886 for private street works.

Ramsgate T.C.—£1,820 for wood paving.

Southampton T.C.—£3,360 for a housing scheme; £350 for a reservoir.

Tamworth T.C.—£15,000 for the erection of sixty-seven workmen's dwellings.

Twickenham U.D.C.—£5,240 for works of private street improvements in Cole Park-road, Cole-road, Hill View-road, and Ivy-road, and £300 for private street improvements in Grove-road.

Walthamstow U.D.C.—£14,590 for electricity plant.

Warrington T.C.—£7,540 for paving works.

Worksop U.D.C.—£2,700 for road improvement.

LOANS SANCTIONED.

Barrow T.C.—£6,508 for the purposes of road improvement, and £665 for an underground convenience.

Beckenham U.D.C.—£2,900 for recreation ground extension.

Biddulph U.D.C.—£300 for road improvement.

Bournemouth T.C.—£3,829 for wood blocks, and £1,771 for wood block paving; £250 for building a cottage, and £3,500 for the provision of police barracks.

Brighton T.C.—£1,400 for street improvement.

Brixham U.D.C.—£3,810 for a housing scheme.

Darwen T.C.—£3,500 for works of water supply.

Gillingham T.C.—£2,500 for the purchase of a site for a pleasure ground.

Hanwell U.D.C.—£1,400 for a public convenience.

Hendon U.D.C.—£681 for street works.

Kidderminster R.D.C.—£446 for a water supply for Churchill.

Lancaster T.C.—£3,305 for the construction of a new street.

Petersfield R.D.C.—£8,750 for the Liss sewage disposal scheme.

Rhyl U.D.C.—£2,500 for improvements on the foreshore.

Rotherham R.D.C.—£2,441 for highway improvements.

Sheerness U.D.C.—£6,960 for building a beam engine-house in connection with the new water supply.

Stoke-on-Trent T.C.—£30,000 to cover overdrafts in the electricity accounts and further anticipated works.

Woking U.D.C.—£630 for road improvements.

FORTHCOMING INQUIRIES.

NOVEMBER.

		£
9.—**Rawmarsh.**	For works of sewerage (Mr. R. H. Bicknell)	2,000
10.—**Bowland.**	For the provision of cottages (Mr. Courtenay Clifton)	1,400
10.—**Bristol.**	For works of sewerage (Mr. F. H. Tulloch)	1,600
10.—**Cheriton.**	For road improvement (Mr. Edgar Dudley)	3,000
10.—**Cricklade.**	For works of sewerage (Major J. Stewart)	1,200
10.—**Hemel Hempstead.**	For sewerage works (Mr. P. M. Crosthwaite) ...	5,900
10.—**Kingston-upon-Hull.**	For the construction of a boating lake (Mr. R. H. Bicknell)	7,500
10.—**Leek.**	For the purposes of the gasworks and new streets (Mr. M. K. North) ...	3,485
10.—**Sheffield.**	For works of street widening (Mr. R. H. Bicknell)	2,000
11.—**Bollington.**	For the improvement of the recreation ground (Mr. M. K. North)	350
11.—**Bradford.**	For the provision of cottages (Mr. C. T. Clifton)	1,800
11.—**Heston.**	For the provision of an electrical motor vehicle (Major J. Stewart)	840
11.—**Rhondda.**	For the electricity undertaking (Mr. H. R. Hooper)	6,000
11.—**Urmston.**	For works of sewerage (Mr. F. O. Stanford)	—
12.—**Nottingham.**	For road construction, piling, and culverting (Mr. P. M. Crosthwaite)	—
12.—**Nuneaton.**	For the purchase of a steam roller, street works, and the provision of a public convenience (Mr. M. K. North)	1,430
12.—**Penybont.**	For road widening (Mr. F. H. Tulloch)	2,015
12.—**Radcliffe.**	For works of sewerage (Mr. F. O. Stanford)	5,739
13.—**East Preston.**	For the erection of working-class dwellings (Mr. Courtenay Clifton)	800
13.—**Llanelly.**	For the purpose of pleasure grounds (Mr. F. H. Tulloch)	1,300
	TOWN PLANNING.	
20.—**Neath.**	(Mr. George L. Pepler)... ...	—

LONDON ELECTRICITY SUPPLY.

PROPOSED NEW AUTHORITY.

The London County Council on Tuesday had before them the recommendation of a Special Committee for the establishment of a new body, to be known as the "London Electricity Authority," which should deal generally with electricity supply in the area, and have full powers of control over the new electricity undertaking which it is suggested should be created. The county and county borough councils within the area (comprising the counties of London and Middlesex, and parts of Essex, Hertford, Kent, and Surrey) would be represented on the authority.

The committee suggested a sort of municipal and private partnership, or, as they term it, a combination of municipal control and private operation. They propose that the undertaking should be worked for fifty years by a statutory company, subject to control and direction by the authority.

The powers of compulsory purchase of existing undertakings now vested in the council and other municipal bodies are proposed to be transferred to the new authority.

It is estimated that the amount of capital which will have to be provided by the authority for new works is about £5,000,000 for the first period of five years, and further sums thereafter at the rate of something like £1,000,000 a year.

Housing and Town Planning.—At a conference of local authorities at Exeter, under the auspices of the National Housing and Town Planning Council, it was decided that the war should not deter local authorities from proceeding with housing schemes. Authorities were urged to carry through such schemes without delay.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important proposed works of which particulars appear below: Buildings—Birmingham, Doncaster, Huddersfield, Luton; housing and town planning—Leigh; roads and materials — Cardiganshire, Chorley, Warrington; sewerage and sewage disposal — Holden Bridge, Pontypridd; water, gas and electricity—Southampton. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Bexley U.D.C.—The surveyor, Mr. W. T. Howes, has received instructions to prepare plans for a new hospital building.

Birmingham T.C.—A scheme has been approved for the erection of the West Heath Hospital, at an estimated cost of £8,600.

Burnley R.D.C.—Recently three completed schemes were formally opened on the same day. These were a new sewer in the reconstructed arches the river near Dam Head, the reconstructed waterworks at White Moor, Foulridge; and the sewerage and sewage disposal works at Downham.

Doncaster T.C.—New municipal offices are to be erected in the near future in Priory-place, next to the Post Office.

Edinburgh T.C.—The new public hall at Portobello, which gives accommodation for over 1,000, and has cost, all in, about £9,000, was formally opened on Friday last.

Huddersfield T.C.—The council have approved the designs for the proposed new swimming baths in Cambridge-road, and have decided to obtain tenders for the work.

Luton T.C.—It has been decided to carry out extensions at the Spittlesea Hospital, at an estimated cost of £5,320.

Midhurst R.D.C.—A resolution has been passed that the council would be prepared to join with Westhampnett and Westbourne in the provision of an isolation hospital.

Panteg U.D.C.—The council have formally adopted the Baths and Washhouses Act, and it is expected that the necessary sanction of the Local Government Board to the borrowing of £900 for the building will follow in due course.

Whitby U.D.C.—It has been agreed to apply for a further loan for the completion of the harbour works. It was stated that the engineer's estimate for the whole of the works was about £73,000. The council accepted a tender for £59,300—a considerable saving on the estimate. In addition, certain repairs to the West Pier End were carried out to the extent of about £2,275—a total of £61,575. The work which had been actually done on the contract amounted to £56,837, which, with the extra work added, made the total expenditure £59,112.

Wigan T.C.—A scheme has been approved for the enlargement of the swimming bath and the rebuilding of the washing baths.

York T.C.—The Health Committee have recommended the city council to join the East Riding County Council in the provision of a joint tuberculosis sanatorium at Raywell, near Cottingham.

HOUSING AND TOWN PLANNING.

Bury T.C.—Competitive plans are being invited for a housing scheme to consist of fifty dwellings.

Campden R.D.C.—A scheme has been adopted for building twelve working-class dwellings, at an estimated cost of £2,700.

Chester-le-Street R.D.C.—It is proposed to provide forty-seven working-class dwellings, at an estimated cost of £12,280.

Leigh T.C.—A scheme is under consideration for building a large number of working-class dwellings at an estimated cost of £48,000.

Llandudno U.D.C.—A tender has been accepted for the erection of sixteen cottages.

Steyning East R.D.C.—The surveyor, Mr. G. W. Watt, has prepared a town planning scheme for Preston rural district and portions of the parishes of Portslade, Hangleton, West Blatchington, and Patcham.

Wallsend T.C.—The council on Tuesday last agreed to make application to the Local Government Board to appropriate for the purpose of additional housing accommodation 8 acres of land which constituted a portion of 33 acres purchased for the purpose of a burial ground.

York T.C.—The Health Committee recommend the council to apply to the Local Government Board to sanction the purchase of an estate in Tang Hall-lane for a housing scheme, without waiting till the application can be made in respect of the erection of houses. The council are also recommended to build twenty-four self-contained, two-storeyed cottages, 100 houses with five rooms, scullery, and bath-room, forty-eight houses of two other types, as soon as all preliminaries have been carried out, subject to certain conditions as to the state of unemployment and the price of building materials.

PARKS AND OPEN SPACES.

Edmonton U.D.C.—A scheme has been prepared for extensive works in the public parks and recreation ground, and application has been made to the Local Government Board for a grant towards the cost.

Stoke-on-Trent T.C.—It is proposed to lay out Fenton Park, at an estimated cost of £9,500.

ROADS AND MATERIALS.

Barmouth U.D.C.—The Road Board have sanctioned a grant of £600, and the county council £150 towards the cost of widening Llanaber-road.

Cardiganshire C.C.—Plans are being prepared for an improvement on the Cenarth-Cardigan road, the estimated cost of which is £7,000.

Cardiff T.C.—A proposal which has been periodically before the council for the last thirty years was again raised at the Public Works Committee, but nothing came of it. This is, as suggested by Councillor Blower, whether something could not be done in the way of constructing a main or circular road around the city, forming direct access from one residential area of the city to another. At present, he said, much traffic congestion was caused by the fact that vehicles, in passing from one area to another, had invariably to pass through the city centre. If the corporation delayed action, it would only cost them thousands of pounds more for the land.

Cheadle R.D.C.—The surveyor of highways, Mr. W. P. Inskipp, has submitted a scheme for an improvement of the road near to Cheddleton Station, at an estimated cost of £352. He also proposes to treat High-street with tar-macadam, at an estimated cost of £390.

Chorley R.D.C.—Consideration is being given to a scheme for a new road from Chorley to Coppull, the cost of which is estimated at £15,000.

Cowes U.D.C.—The council have accepted the tenders of the Associated Portland Cement Company for the supply of cement, of Messrs. Rowe & Mitchell for 200 tons of granite, and of Mr. Downer for gravel.

Croydon R.D.C.—The surveyor, Mr. R. Chart, has received instructions to apply to the Road Board for contributions towards the cost of a number of road improvements that are to be carried out as relief works for the unemployed.

Kingston (Surrey) T.C.—Of six tenders for the supply of 250 yds. of broken granite, that of Messrs. Lavender & Bateman, of Sutton Bridge, at 14s. 9d. per yard, has been accepted.

Northumberland C.C.—The Bridges and Roads Committee have received authority to prepare plans and estimates for a coastal road from Blyth to Amble.

Salisbury T.C.—The borough surveyor, Mr. W. J. Goodwin, has submitted a report in which he estimates that to carry out the proposed improvement

of Castle-street would cost £1,065 and that the London-road would entail an expenditure of £747, making a total of £1,812. The sum had been allowed by the county council for this year £527, and they anticipated that £527 would be allowed for next year, making a total of £1,054, and leaving a balance of £758. It was suggested that the Road Board should loan them that amount, but it had been impressed upon the Road Board that it would be much better if they gave the money, and that the council were not asked to repay it, because if they had to repay the money of course work on other roads would be lying up. This estimate would be presented to the Road Board.

South Stoneham R.D.C.—The surveyor, Mr. F. Heather, reported to the council that he had added to the list of relief works a proposal for widening Bang-street and Ampyard, forming a footpath down one side and constructing an efficient surface-water drainage system. Owing to the cost, which would amount to between £2,000 and £3,000, he did not include it before, but the county surveyor mentioned, although he could not say definitely, that the Road Board might contribute some 80 per cent of the cost. The council would, of course, be able to come to a final decision when the intentions of the Road Board as regarded grants and loans were known.

Thirsk R.D.C.—Some time ago the surveyor, Mr. C. A. Lake, suggested haulage in bulk by petrol tractor in place of the system of accepting tenders for each individual parish. The chief question for the committee to whom this matter was referred was whether the council should purchase a tractor or invite tenders for the work. They decided on the latter course, and the council have now accepted the tender of Mr. T. O. Todd, Bagby, to do the work at 1s. 5d. per ton, as against a former average cost of 2s. 1d. per ton.

Warrington T.C.—The Paving and Sewerage Committee have resolved to pave Buttermarket-street with Lithofalt blocks, and to repave other streets, at an estimated cost of £7,540.

Worthing T.C.—With respect to the scheme to make up Grand-avenue under the Private Street Works Act, an amendment was moved at the council meeting recently to refer the matter back to consider the adoption of a proposal to provide gardens in the middle of the road. This was opposed by Councillor Chignell, who said he considered the scheme chosen by the Highways Committee was the best one. The public appreciated the wide footpaths with grass borders on each side, and a good carriageway. He did not consider it would be an improvement to put "little pottering gardens" in the middle and have a road on each side. There would be constant expense and attention; the gardens would be in the way of the traffic, and the public would be unable to walk over them. The amendment was lost, and the committee's recommendation carried.

Yiewsley U.D.C.—Discussing the questions of tar-macadam and tar-spraying in his annual report, published recently, the surveyor to the council, Mr. John Lewis, says: "The great difficulty in the way of rapidly transforming our gravel-surfaced roads into tar-macadam roads is, as before stated, a question of initial cost. With highway estimates cut down to the lowest possible margin, I am obliged to maintain roads where, if efficiency was the only consideration, I should reconstruct them. An endeavour is being made to convert most of the roads laid with dry gravel into tarred-surface roads. If the necessary funds were available, I should recommend the committee, both on the grounds of efficiency and economy, to lay tar-macadam in future on all our roads. As a rule, conversion would be possible at a price of about 2s. 9d. per super. yard, and when we appreciate the fact that this small urban area is responsible for the maintenance of some 66,000 sq. yds. of road surface, a small calculation will show the figure required to be expended on re-conversion works alone. Again, on account of funds, tar-spraying of road surfaces has been curtailed to a maximum of 15,000 super. yds., whereas on the grounds of preserving the road crust, and reducing the amount of mud in wet weather, I advocated the area to be treated should be considerably increased. There is no doubt but for the surface treatment with tar of the gravel-surfaced roads, their maintenance costs would have been higher, and I am satisfied as to the economy of the process, when applied to roads in a fair state of repair, but it is false economy to apply the tar where roads are otherwise."

SEWERAGE AND SEWAGE DISPOSAL.

Barnoldswick U.D.C.—A repeat order has been placed with Ames Crosta Sanitary Engineering Company, Limited, of Nottingham, for the supply of two 78-ft. diameter patent "Simplex" rotary sprinklers and fittings.

Burnley R.D.C.—It is proposed to expend £1,200 upon alterations to the Hameoat sewage disposal works.

Cockermouth R.D.C.—A sewerage scheme for Low Seaton is to be carried out at an estimated cost of £1,640.

Croydon R.D.C.—The relaying of surface-water drains is to be carried out as a means of relieving unemployment.

Hebden Bridge U.D.C.—Sanction has been received to the scheme for the extension of the sewage disposal works.

Horsham R.D.C.—Upon the suggestion of the Local Government Board, it has been arranged to obtain expert advice upon the condition of the Billingshurst sewage disposal works.

Lewes T.C.—The drainage scheme, the cost of which is expected not to fall far short of £50,000, is nearing completion.

Leyburn R.D.C.—Consideration is to be given to the amended plans of a scheme for the drainage of the whole of West Witton, according to the Local Government Board's request to the council. Mr. Rodwell, the engineer, estimates the cost of the work at £1,125, and £75 for land, easements, and legal expenses, making a total of £1,200.

Oakengates U.D.C.—The council last week received a letter from the engineer stating that the total cost of the sewerage scheme already carried out was £15,350, whereas the loan was only for £14,220, an excess over the loan of £1,110. This was accounted for chiefly owing to the increased prices of materials between the preparing of the estimate and the letting of the contract. It was further stated that it was imperative that the sewerage of New-street and Slaney-street be carried out before the wet weather sets in, in order to complete the scheme. It was resolved to send plans to the Local Government Board, asking for sanction to a loan to cover the cost.

Prestatyn U.D.C.—The council have adopted the scheme prepared by Mr. John H. Blizard, ASSOC.M. INST.C.E., consulting engineer, of Westminster and Southampton, for the sewerage and sewage disposal of their district.

Wath-upon-Dearne U.D.C.—An order has been placed with Ames Crosta Sanitary Engineering Company, Limited, of Nottingham, for the whole of the ironwork and fittings required in the new sewage disposal works about to be carried out, including three 91½-ft. diameter patent "Simplex" rotary sprinklers and fittings, one patent Fieldhouse sedimentation tank, one lime mixer, screens, penstocks and valves.

WATER, GAS, AND ELECTRICITY.

Belfast T.C.—The council have determined to postpone the proposed scheme for the erection of new electricity generating works, but in order to meet the requirements of the ensuing three years it has been agreed to make such alterations and additions to the plant in the existing works, provide and equip the necessary sub-stations, and provide and lay cables, at a cost not exceeding £25,000.

Bideford U.D.C.—With respect to the work of deepening the higher reservoir, which is proceeding, the surveyor, Mr. R. E. L. Hookway, has suggested that the contractors should continue and provide for another 1,092,000 gallons at an approximate cost of £460. This the council regarded very favourably, subject to the approval of the engineer, Mr. Baldwin Latham.

Bradford T.C.—The Water Committee propose to accept Messrs. C. Bushby & Sons' tender, at £29,073, for the carrying out of the duplication of seven pipe syphons in connection with the Nidd Aqueduct.

Gloucestershire C.C. — An intimation has been received from the Woods and Forests Department that the Crown would sanction a grant of £5,000 towards the cost of providing a water supply for Coleford and West Dean.

Hexham R.D.C. [illegible] the water supply [illegible] £1,000.

Hinckley R.D.C. The following tenders have been accepted in connection with the Barwell water supply: Laying of mains, Mr. Geo. Graves, Hinckley, £921; workshop and roads, Mr. E. Chamberlain, [illegible] Mr. [illegible] fencing, Parsons, Sherwin & Co., Hinckley, £53.

Paul (Cornwall) U.D.C.—Plans of a water scheme [illegible] the council have [illegible] loan of £7,000 or £8,000 for a water and sewerage [illegible] at a very [illegible] rate of interest.

Southampton T.C.—Tenders are to be obtained for the construction of a reservoir. The approximate [illegible] £27,000.

Torquay T.C.—The new water main has been laid from Tottiford to Beadon Brook, which represents about one-third of the total length of pipe to be laid, and tenders are being invited for the further extension to Sandford Orleigh, Newton Abbot.

Twickenham U.D.C.—The council have accepted the tender of Messrs. Dennis Brothers (1913), at £1,125, for the supply of a 400-450-gallon petrol motor fire engine, complete with pump, 50-ft. fire escape, and first-aid equipment.

MISCELLANEOUS.

Liskeard R.D.C.—At the council meeting on Saturday Mr. Truscott, the assistant sanitary inspector at £40 a year, who is at present acting as road surveyor for the Northern District, in the absence of Mr. Smale, serving with the colours, made application for an increase of £40 a year, pointing out that it cost that sum to run his motor cycle. Consideration of the matter was adjourned.

Ripon R.D.C. It has been agreed to give twelve months' notice to the Ripon Corporation to terminate the agreement by which £15 per annum is paid for the upkeep of the city fire brigade.

PERSONAL.

Mr. James Jones, of Dolwen, Rhydlewis, has been appointed surveyor to the Llandyssul Rural District Council.

Mr. R. F. Braithwaite, surveyor to the Selby Rural District Council, has been voted £10 a year for the upkeep of his motor cycle.

Mr. W. E. Woollam, surveyor and inspector to the East Grinstead Urban District Council, has had his salary increased by £50 per annum.

Mr. D. B. Elliott, of Bloomfield, Belfast, has been appointed assistant surveyor for portions of Ballymoney and Antrim rural districts under the Antrim County Council.

Mr. Charles Herbert, assistant to Mr. Geo. Riley, engineer and surveyor to the Wellington (Salop) Urban District Council, has been appointed general assistant to the county road surveyor (Mr. W. Jervis) for East Suffolk.

Mr. S. Sutcliffe, surveyor to the Mytholmroyd Urban District Council, has been voted an additional sum of £10 as salary during the month of October for the services he had rendered in connection with the extension and laying of the new water main from Pismire Hill to Upper Foot. It was stated that the work of the surveyor had been "very creditable indeed."

Mr. J. Henry Taylor, M.INST.C.E., borough surveyor and waterworks engineer of Barnsley, has been appointed acting barracks engineer to the Barnsley Battalion of the York and Lancaster Regiment of Lord Kitchener's Army. Mr. Taylor has set out the camp, has obtained tenders, and will superintend the erection of the huts, which are estimated to cost £10,000.

Mr. E. Y. Harrison, ASSOC.M.INST.C.E., engineer and surveyor to the Wellingborough Urban District Council, who has been appointed borough surveyor and water engineer of Guildford, was presented recently, on behalf of the staff at Wellingborough, with a polished-oak smoking cabinet suitably inscribed. The presentation was made by Mr. C. G. Atkinson, assistant surveyor, and Mr. Harrison, in reply, referred to the loyalty and good feeling which the members of the staff had always displayed.

Mr. Vincent J. Willis, assistant surveyor at Morecambe, [illegible] municipal staff with an inlaid mahogany writing desk, bearing a silver tablet suitably inscribed, and a silver pen, upon the occasion of his leaving Morecambe to take up a position in the council [illegible] at Halifax. The presentation was made on behalf of the subscribers, by the borough surveyor of Morecambe, Mr. F. W. Hipwood, who expressed his regret at the pending departure of Mr. Willis, whom he had always found to be an efficient and willing colleague. He wished Mr. Willis every success.

FOR OTHER ADVERTISEMENTS

See End of Paper.

COUNTY BOROUGH OF BOLTON.
WATERWORKS DEPARTMENT.

The Corporation invite applications for the position of Junior Engineering Assistant in the Waterworks Engineer's Department.

Salary commencing at £65 per annum.

Applications, in candidate's own handwriting (endorsed "Junior Engineering Assistant"), stating age, qualifications, and experience, together with copies of original drawings prepared by the candidates, and three testimonials of recent date, which will not be returned, to be delivered to the undersigned not later than the 25th November, 1914.

Canvassing, directly or indirectly, will be considered a disqualification.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton.
November 4, 1914. (2,065)

TEMPORARY ASSISTANT REQUIRED in the Office of a Borough Surveyor and Waterworks Engineer (population of district 16,000).

Salary £2 per week.

Applications and copies of three testimonials (which will not be returned) to be sent to Box 1,481, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C., not later than Friday, 13th November, 1914. (2,064)

PRACTICAL ROAD SURVEYOR or Foreman Manager to take charge of outside work in connection with the Hipperholme Urban District Council.—Apply by letter, stating qualifications, wages, &c., to the Clerk to the Council, 4 Harrison-road, Halifax, on or before 23rd November, 1914. (2,066)

BOROUGH OF ASHTON UNDER LYNE.

SEWAGE DISPOSAL WORKS RECONSTRUCTION.

CONTRACT No. 4.

The Corporation invite Tenders for the Alteration and Extension of their Sewage Disposal Works at Plantation Farm, Dukinfield.

Plans may be seen, and copies of the Specification, Bill of Quantities, and Form of Tender obtained from the Engineer, Mr. J. Rowbottom, Town Hall, Ashton-under-Lyne, on payment of £5, which will be returned on receipt of a *bonâ-fide* Tender and upon the return of all documents supplied to him.

Tenders, in official envelopes, to be delivered to the undersigned not later than first post on November 11th, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

JOHN NEAL,
Borough Comptroller.

Town Hall,
Ashton-under-Lyne.
October, 1914. (2,067)

BOOK BARGAINS FOR DISPOSAL.

18 Bound Vols. "The Public Health Engineer," 1897-1906.

27 Bound Vols. "Proceedings, Association Municipal Sanitary Engineers and Surveyors." 1874-1905.

What offers for both, or each set?—Box 1,482, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,068)

CLARIDGE'S PATENT ASPHALTE COMPANY.

In order to cope with the requirements of their increasing business, Claridge's Patent Asphalte Company, Limited, have established themselves at new offices, 3 Central Buildings, Westminster, S.W., and on Saturday last the firm received a company of representative guests at what may be termed an informal house-warming. The visitors inspected with interest the handsome suite of offices, furnished in the most up-to-date style, and equipped with every modern appliance that inventive skill and ingenuity have devised to facilitate and accelerate the movement of the official machinery. The history of this well-known firm since it was established in 1838 goes to show, for a period when some of the great industrial enterprises of London were still in their infancy. Suspended upon the wall of the managerial sanctum is a painting in oils of the original works of the company in Lambeth, upon the site now occupied by St. Thomas's Hospital, from which one may estimate the foresight of the founders in taking advantage of the opportunities offered by the great waterway of the Metropolis. Among the more curious historical documents that came under notice was a framed copy of the initial prospectus of the company, with its authorised capital of £200,000 in 10,000 shares of £20 each, and the figuring thereon of what was doubtless a familiar feature of such prospectuses in those days—viz., a list of "patrons." The names of these included the Duke of Bedford, Marquis of Aberdeen, Marquis of Douglas, Earl Elgin, Earl Lovelace, M.P., and Sir J. Henry, Bart. Incidentally it may be stated that the first consulting engineer was Mr. Mark J. Brunel.

In the course of a statement dealing with the history and operations of the company, the manager, Mr. W. Allback, stated that their reason for taking more commodious premises was a satisfactory one, inasmuch as it was owing to their increasing trade in asphaltes. They had also entered into another business—that of tarred slag macadam, under the title of Clarmac Roads, Limited. They started this with works at Bilston, and had since then acquired further properties at Chatterly, in Staffordshire. Their slag heaps were some of the best in all England, consisting as they did of old cold-blast furnace slag, which, owing to its infinitely greater durability over the present-day hot-blast slag, was so much more suitable for road making. He thought they would do a big business in this, and they would try and do their best. Formed in 1838, with a capital of £200,000, to work the patents acquired by Mr. Claridge, in five years the company acquired such a firm hold in this country that the Board of Ordnance placed large orders for asphalting forts, batteries, &c., throughout the kingdom. About 1860 the War Office entered into a contract with the company for all asphalte work under the supervision of the Royal Engineers, which they held, giving unbounded satisfaction for an unbroken period of forty years, when increasing competition made it an unprofitable contract from their point of view. They were also fortunate in having a fair supply of asphalte rock in stock, and further supplies on order and *en route* to their works, and they had no fear as to being unable to fulfil their orders, although these latter had enormously increased this last eighteen months or two years, this being largely due to the advertising campaign they had carried on, and to the kindly notice of their efforts. With respect to Clarmac, this immediately found favour with surveyors owing to its composition, being manufactured from the best hard cold blast furnace slag, and orders had been received from the corporations and councils of Southend-on-Sea, Marylebone, Beckenham, Coventry, Wiltshire and others.

In the course of the proceedings "Success and Prosperity to the Company" was proposed and honoured with much heartiness, acknowledgments being duly made by Mr. W. Allback, Mr. F. J. L. Jackson (solicitor) and Mr. George Mason, a recent accession to the business staff.

Concrete Institute. At a meeting to be held at Denison House, Vauxhall Bridge-road, Westminster, on Thursday, November 19th, at 7.30 p.m., Prof. Henry Adams, M.INST.C.E., M.I.MECH.E., F.S.I., will deliver his presidential address.—In view of the war the council has decided to adjourn the matter of continuing educational lectures until a session subsequent to the forthcoming seventh session of 1914-15.

JUNIOR INSTITUTION OF ENGINEERS.

THE WORKING OF STORAGE BATTERIES.

In the room of the Junior Institution of Engineers Mr. Robert Rankin, B.SC., lectured recently on "The Working of Storage Batteries."

The different types of battery were described briefly, and particular stress was laid on the absolute necessity of giving a battery a good send-off by seeing that it received a proper first charge. Prevailing misunderstandings regarding the completion of the first charge were dealt with, and the necessity of continuing it until there is a complete cessation of increase in specific gravities and voltages. The principal battery troubles caused by working, as against those caused by the use of impure electrolyte, were gone into at some length, the effects being described and also methods of meeting and overcoming the troubles. It was specially emphasised that cells are not like machines, but, in fact, rather resemble animal workers in their characteristics. When this fact is properly realised battery troubles will be greatly decreased.

One fruitful source of trouble being excessive discharging, Mr. Rankin described an instrument which he has invented to enable battery operators to keep within proper limits, the instrument and curves showing the variations of battery capacity with rate of discharge, among other things, being shown on lantern slides. Attention was drawn to the necessity in the case of stationary batteries, of keeping proper log sheets of the working and of adhering intelligently to a proper set of working instructions instead of religiously stopping the discharge at a definite voltage and stopping the charge when the ampere-hours put back after a discharge reach a definite percentage over the latter, both voltage and ampere-hours being indicated by instruments which may be very badly out in their accuracy. Lastly, Mr. Rankin said it cannot be expected of battery attendants that they will keep their cells in decent condition unless they have hydrometers and cell-testing voltmeters, and means for giving individual cells a boosting charge in excess of that given to the main body of the battery.

THE EMPTYING OF CESSPOOLS.

The parish authorities of Langley (Bucks) have for many years employed the ordinary sewage pump for emptying the cesspools in their district, but the drawbacks inherent to this system are great, chiefly owing to the unpleasant nature of the work and the time and labour involved. The authorities have accordingly decided to adopt the pneumatic system of cesspool emptying, by means of which the air is exhausted from a cylindrical tank and the contents of the cesspool drawn up into the tank by atmospheric pressure. The efficacy of this plant being dependent upon air-tight conditions, it follows that there is an entire absence of nuisance.

Langley comes under the jurisdiction of the Eton Rural District Council, which has had experience with the Merryweather type of pneumatic cesspool exhauster, two of which have been in use in other parishes for some years past with entirely satisfactory results. It has been decided to meet the requirements of Langley by the provision of two further vacuum tanks, each of 350 gallons capacity, and arranged for horse draught, and the order for these has been placed with Messrs. Merryweather & Sons, of Greenwich. A pump is necessary for exhausting the air from the tanks, and in this connection a novelty is to be introduced. In the former type this work has been effected by a hand-worked air pump, but in the case of the new tanks a neat little 2-h.p. petrol-driven air pump of the double-barrel "Ravensbourne" type, mounted on a four-wheeled carriage which can be easily towed behind one of the tank vans, will be employed. This pump will be available for use with either of the two tanks, and it is calculated that the saving of labour thus secured, combined with the greater rapidity with which the power-driven plant can be worked, will greatly reduce the cost of emptying cesspools in the parish of Langley.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

INSTITUTION OF MUNICIPAL ENGINEERS.

[illegible] Mr. Hector [illegible], M.Inst.C.E., [illegible] Wells and Westminster.

[illegible] Mr. W. H. Matthews Jones, C.E., Engineer and Surveyor, Chester.

ANNUAL MEETING IN LONDON.

[illegible] 28th.

PROGRAMME.

[illegible] Northumberland Chambers, No. 4 South-ampton-row, London, W.C.

[illegible]

Presentation of annual report of council.

Announcement of result of ballot for election of council for the year 1914-15.

[illegible]

2.30 p.m.—Re-assemble in Council Chamber.

2.45 p.m.—Presidential address.

Discussion on the following papers to be [illegible]

"A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts," by G. Belson Chilvers, M.R.San.I. (member).

"Housing of the Working Classes," by Edward Whitwell (member).

"The Future Control and Maintenance of Rural Roads," by J. S. Wooddisse (member).

The papers will be taken as read, and advance copies may be obtained on application to the secretary, and will be forwarded as soon as the papers are in print.

Meetings will be held at Northumberland, Saturday, November 7th, and December 12th.

B. Wyane,
39 Victoria-street, S.W. *Secretary*

A Glossary of Road Terms (By H. Percy Boulnois, M.Inst.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation. *Times Engineering Supplement.*

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

DISTRICT ROAD SURVEYOR.—November 7th.—County Council of Ross and Cromarty. £150 a year.—Mr. Donald Mackenzie, district clerk, Torridon, Ross-shire.

JUNIOR ASSISTANT.—November 9th.—Foots Cray Urban District Council. £70—£90 per annum.—Mr. W. Augustus Farnham, engineer and surveyor, Council Offices, Sidcup, Kent.

SEWAGE WORKS MANAGER.—November 10th.—Corporation of Dewsbury. £400 per annum.—Mr. H. Ellis, town clerk.

CLERK OF WORKS.—November 10th.—Markets Committee of the Leeds Corporation. £3 per week.—Mr. R. E. Fox, town clerk.

DRAUGHTSMAN.—November 10th.—Corporation of Barrow-in-Furness. £3 per week.—Borough Engineer and Surveyor.

ENGINEERING ASSISTANT.—November 12th.—Corporation of Wrexham.—Mr. J. England, borough engineer.

ENGINEERING ASSISTANTS.—November 12th.—Corporation of Birmingham. £130—£150.—Mr. Henry E. Stilgoe, city engineer and surveyor.

BOROUGH SURVEYOR AND INSPECTOR.—November 14th. Corporation of Macclesfield. £150 per annum.—Mr. Bickerton H. Deakin, town clerk.

SEWAGE WORKS MANAGER.—November 14th.—Ashton-in-Makerfield Urban District Council. 50s. per week. Mr. Albert Sykes, clerk, Council Offices.

ROAD FOREMAN.—November 16th.—Corporation of Birmingham. 40s.—45s. per week.—Mr. H. E. Stilgoe, city engineer and surveyor.

ROAD FOREMAN.—November 16th.—Corporation of Beeston. [illegible] per week. Mr. J. S. Dunnicliff, town clerk.

TEMPORARY ASSISTANT.—November 21st.—Kettering Urban District Council. £80 per annum.—Mr. John Bond, clerk.

CLERK OF WORKS.—November 24th. West Suffolk County Council. £2 15s. per week.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

CLERK OF WORKS.—November 25th. Petersfield Rural District Council. £2 10s. per week.—Mr. A. J. C. Mackarness, clerk.

HIGHWAY SURVEYOR.—November 25th.—Llanybther Rural District Council. £45 per annum.—Mr. J. Ernest Lloyd, clerk, 28 High-street, Lampeter.

ASSISTANT COUNTY SURVEYORS.—November 30th.—Cornwall County Council. £150—£200.—Mr. Christopher L. Cowlard, clerk, County Council Offices, Bodmin.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

ASSISTANT SURVEYOR.—Corporation of Tenby.—Mr. B. Morley, borough surveyor.

ASSISTANT ENGINEER.—Lagos Municipal Board of Health, Nigeria. £300. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department of the Government of the Gold Coast. £350—£400. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BILLINGE.—November 10th. Specifications for, and for superintending the making of an experimental borehole, for the urban district council.—Mr. A. Darlington, clerk.

SOUTHEND.—December 4th.—Schemes for a tuberculosis hospital, for the corporation. Premiums £100, £50, and £25.—Mr. E. J. Elford, borough engineer.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

LANCASHIRE.—November 10th.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

BARNET.—November 10th.—For the erection of thirty-two cottages and a block of flats, for the urban district council.—The Surveyor.

UXBRIDGE.—November 10th.—For the erection of twenty-eight dwellings, for the urban district council.—Mr. W. L. Eves, surveyor, 54 High-street.

BARNET.—November 11th.—For the erection of twenty-four cottages, for the rural district council.—Mr. A. J. Wilshire, surveyor.

SHEFFIELD.—November 12th.—For the [illegible] of a boundary wall, for the corporation.—City Engineer.

DURHAM.—November 14th.—For the [illegible] dispensary, for the [illegible] County Surveyor, Shire Hall, Durham.

KIRKCALDY.—November 14th.—For the erection of a sanatorium and other works, for the corporation.—Burgh Surveyor.

WELLS (Norfolk).—November 14th.—For the erection of [illegible] buildings, for the [illegible] district council.—Mr. H. Kennard, architect, 26 Great James-street, Bedford-row, London, W.C.

WAKEFIELD.—November 16th.—For the erection [illegible] for the cattle market, for the corporation.—Mr. J. P. Wakeford, city surveyor.

DUNDALK.—November 16th.—For sinking a well and erecting a pump, for the rural district council.—Mr. P. Cahill, Francis-street, Dundalk.

GREETLAND.—November 16th.—For the erection of public lavatories and waiting-room, for the urban district council.—Messrs. R. Horsfall & Son, architects, 22A Corporation-street, Halifax.

WIGAN.—November 16th.—For the extension of the swimming bath, for the corporation.—Mr. A. T. Gooseman, borough engineer.

HORNSEY.—November 16th.—For the erection of an electric lighting station, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

BRIGHTON.—November 17th.—For demolishing and rebuilding 83 Grand-parade, for the corporation.—Borough Surveyor, Town Hall.

GODSTONE.—November 17th.—For the erection of a cottage at the sewage works, and laying a sewer, for the rural district council.—Mr. T. C. Barralet, surveyor, Station-road, West Oxted.

BARNET.—November 17th.—For the erection of council offices and an underground convenience, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor.

GLOUCESTER.—November 19th.—For the erection of a tuberculosis block, for the corporation.—Mr. R. Read, city surveyor.

STAMFORD.—November 20th.—For the erection of twenty-four cottages, for the corporation.—Mr. F. R. Ryman, borough engineer.

HAMPSHIRE.—November 20th.—For the erection of a new school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BARNSLEY.—November 21st.—For the erection of a school, for the Education Committee.—Mr. E. W. Dyson, architect, Regent-street, Barnsley.

BARROW.—November 23rd.—For the erection of a public library, for the corporation.—Borough Engineer and Surveyor.

LONDON.—November 24th.—For the erection of an annexe to engine-house at Abbey Mills pumping station, for the county council.—Chief Engineer, Spring-gardens, S.W.

BRISTOL.—November 26th.—For the reconstruction of the cattle market, for the Market Trustees.—Mr. P. Addis, The Exchange, Corn-street, Bristol.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

CROYDON.—November 10th.—For the supply of 830 tons of cast-iron pipes and specials, for the corporation.—Borough Engineer.

EAST GRINSTEAD.—November 11th.—For the extension of cast-iron mains, for the rural district council.—Mr. C. Turton, surveyor.

DARTFORD.—November 16th.—For supplying and laying cast-iron pipes for the electricity works, for the urban district council.—Mr. W. Kay, clerk.

TORQUAY.—November 17th.—For laying 3,700 yds. and 6,150 yds. respectively of 15-in. and 14-in. cast-iron pipes, for the corporation.—Mr. Samuel C. Chapman, water engineer.

OSWESTRY.—November 23rd.—For providing and laying 4-in. and 3-in. cast-iron mains, sluice valves, fire hydrants, and air valves, for the rural district council.—Messrs. Berrington, Son & Watney, Prudential Chambers, Wolverhampton, and 28 Victoria-street, Westminster, S.W.

BIRKENHEAD.—December 7th.—For the supply of sluice valves, automatic valves, boxes, and gratings, for the corporation.—Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

Roads.

HAYWARDS HEATH.—November 9th.—For private street works, for the urban district council.—Mr. G. Plummer, engineer and surveyor.

EASTBOURNE.—November 9th.—For private improvement works, for the corporation.—Mr. A. E. Prescott, borough surveyor.

KENILWORTH.—November 9th.—For the supply of broken granite and slag, for the urban district council.—Mr. S. Douglas, engineer and surveyor.

ISLINGTON.—November 10th.—For paving with granite setts and wood blocks, for the borough council.—Mr. J. Patten Barber, borough engineer.

CHIPPENHAM.—November 10th.—For the supply of granite macadam, chippings, tar-macadam, steam rolling, disinfectants, tar, Tarvia, and similar materials, for the corporation.—Mr. A. E. Adams, borough surveyor.

WALSALL.—November 10th.—For work of road repair, for the corporation.—The Borough Surveyor.

DEVON.—November 11th.—For the diversion of a road, for the county council.—County Council Offices, The Castle, Exeter.

BIRKENHEAD.—November 11th.—For making up certain roads, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

ROMSEY.—November 12th.—For steam rolling and scarifying, for the corporation.—Borough Surveyor.

CHELMSFORD.—November 12th.—For the supply of Guernsey granite, for the corporation.—Borough Engineer.

NEWMARKET.—November 12th.—For the supply of a steam roller with scarifier, for the urban district council.—Mr. William Henry Eley, engineer and surveyor.

LEEDS.—November 12th.—For making up certain streets, for the corporation.—Highways Department, 135 Kirkstall-road, Leeds.

READING.—November 12th.—For making up part of Albert-road, for the sanitary authority.—Mr. J. Bowen, borough engineer and surveyor.

PRESTON.—November 13th.—For making up certain streets, for the corporation.—Borough Surveyor.

HASTINGS.—November 14th.—For the supply of 1,000 yds. of unbroken blue stone, for the rural district council.—Mr. D. Paine, surveyor, Stonelynk Farm, Fairlight, Hastings.

WAKEFIELD.—November 16th.—For forming private streets, for the corporation.—Mr. J. P. Wakeford, city surveyor.

EAST SUSSEX.—November 16th.—For the supply of materials, haulage, and team labour, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

LUTON.—November 16th.—For the supply of broken slag, for the year ending November 30, 1915, for the corporation.—Borough Engineer.

NORTHUMBERLAND.—November 16th.—For supplying, breaking, and carting stone, and also for the supply of tar, pitch, and creosote oil, for the county council.—County Surveyor, Moot-hall, Newcastle-on-Tyne.

FARNHAM.—November 17th.—For the supply of granite, for the urban district council.—The Surveyor.

WEST HARTLEPOOL.—November 18th.—For the supply of concrete kerbstone flags, scoriæ, whinstone channel blocks, paving setts, hand, machine, and unbroken whinstone, pitch, tar, and lime, for the corporation.—Mr. N. F. Dennis, borough engineer and surveyor.

SOUTHAMPTON.—November 18th.—For the hire of steam rollers during the year ending March 31, 1916, for the county council.—County Surveyor, The Castle, Winchester.

SOUTHAMPTON.—November 18th.—For the supply and delivery of tools for use on main roads, for the county council.—County Surveyor, The Castle, Winchester.

SOUTHAMPTON.—November 16th.—For the supply [illegible] of the [illegible] roads for the [illegible] council.—Mr. S. [illegible], The Castle, Winchester.

WEST SUFFOLK.—November 23rd.—For the supply of tar for the surface treatment of roads, for the county council.—Mr. W. Lionel Jenkins, county surveyor, [illegible]

ELLESMERE PORT.—November 28th.—For making up certain streets, for the urban district council.—Council Offices.

Sanitary.

ROCHFORD.—November 9th.—For constructing about [illegible] yards of glazed stoneware and cast-iron pipe sewers, together with manholes and other works, for the rural district council.—Mr. A. C. Madge, surveyor.

TAVISTOCK.—November 10th.—For the construction [illegible] of sewerage and [illegible] for the rural district council.—Mr. T. H. Harris, 1 Millbrook-place, Tavistock.

NEWQUAY.—November 10th.—For the construction of sewage disposal works, for the urban district council.—Mr. J. Ennor, surveyor, Newquay, Cornwall.

DUKINFIELD.—November 10th.—For the extension of the sewage disposal works, for the corporation.—Mr. J. Rosenthal, engineer, Town Hall, Ashton-under-Lyne.

EASINGTON.—November 10th.—For the construction of about 16,000 lin. yds. of stoneware and cast-iron pipe sewers, with manholes, flushing chambers, and other works connected therewith, for the rural district council.—Mr. G. Waterhouse, engineer.

SEDGEFIELD.—November 11th.—For scavenging and the removal of house refuse, for the rural district council.—Mr. J. W. Tweddle, inspector, Blackgate, Coxhoe, Durham.

LICHFIELD.—November 11th.—For laying sewer and manholes, for the rural district council.—Mr. C. O. Rawstron, surveyor.

ASHTON-UNDER-LYNE.—November 11th.—For the extension of the sewage disposal works, for the corporation.—Mr. J. Rowbottom, engineer, Town Hall.

ORSETT.—November 18th.—For the construction of sewers, and providing engines, compressors, ejectors, and other works, for the rural district council.—Messrs. H. Walker & Son, Albion Chambers, Kingstreet, Nottingham.

PAIGNTON.—November 23rd.—For laying a sewer, for the urban district council.—Mr. C. O. Baines, engineer and surveyor.

PETERSFIELD.—November 25th.—For the construction of about [illegible] gullies at pipe sewer with manholes, and sewage purification works, for the rural district council.—Messrs. Chambers, Smith & Adams, 53 Victoria-street, Westminster, S.W.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

CHATHAM.—November 11th.—For the supply of Thames ballast, crushed ragstone, stock bricks, Portland cement, lime, sewer boots, stoneware drain pipes, street gullies, sewer ironwork, timber, paints, oils, disinfectants, brooms, brushes, picks, shovels, and ironmongery, for the corporation.—Borough Surveyor.

BRISTOL.—November 16th.—For the supply of stores, for the Sanitary and Improvement Committee.—City Engineer.

WEST HARTLEPOOL.—November 18th.—For the supply of road materials, sewer pipes, pitch, tar and lime, for the corporation.—Nelson F. Dennis, borough engineer and surveyor.

Miscellaneous.

OSWESTRY.—November 9th.—For laying mains, sluice valves, and fire hydrants at waterworks, for the rural district council.—Messrs. Berrington, Son & Watney, Prudential Chambers, Wolverhampton, and 22 Victoria-street, Westminster.

CROYDON.—November 10th.—For supplying deep well pumping engine and pumps at waterworks, for the corporation.—Borough Engineer.

SPENNYMOOR.—November 12th.—For the extension of the cemetery, for the urban district council.—Mr. C. R. Spencer, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ABERGELE.—For the construction of a stoneware sewer, for the urban district council.—Mr. M. R. Jones, surveyor.

Allen & Owen, Rhyl	£332
Anderton & Co., Colwyn Bay	280
Jones & Prichard, Abergele	279
W. H. Jones, Abergele	264
G. Lomb, Old Colwyn	240
J. Evans, Old Colwyn	215

Surveyor's estimate, £200.

ANNFIELD PLAIN.—For the erection of eight houses, for the urban district council.—Mr. F. J. Trowsdale, surveyor.

Arthur & McHugh, Tanfoton S.O., Co. Durham	£1,759
K. S. Ledger, Annfield Plain	1,748
Reynolds Brothers, Dipton S.O., Co. Durham	1,700
J. Donkless, Newcastle-on-Tyne	1,702
Lee & Dunn, Annfield Plain ..	1,701
Elliot & Loverick, Annfield Plain	1,662
J. G. Bell, Annfield Plain ..	1,530
J. T. Castle, Annfield Plain	1,515

BRIDGEND.—For making up back lanes, for the urban district council.—Mr. W. F. Tudor, surveyor:—

F. D. Evans, Coity	£160
E. Jones, junr., Coychurch	155
G. Jones, Bridgend	147
Smith & Palmer, Bridgend	137

CHELMSFORD.—Accepted for private street works, for the corporation.—Mr. P. T. Harrison, borough engineer:—

Davey & Armitage, Southend-on-Sea, £850.

FELTHAM.—Recommended for acceptance for the supply of granite, for the urban district council.—Mr. G. Stevens, surveyor.

Dosthill Granite Quarry Company, Limited, Dosthill, near Tamworth.—12s. 11d. per ton.

HALLOW.—For the Hallow sewerage scheme.—Messrs. Willcox & Raikes, Birmingham, engineers:—

Johnson Brothers, Gloucester	£5,139
Tilt Brothers, Bromsgrove	4,935
G. Law, Kidderminster	4,899
Childs & Withers, Worcester	4,557
W. Thorpe, Birmingham	4,333

HAWARDEN.—For the erection of a public convenience, for the rural district council.—Mr. L. F. Wilson:—

W. Astbury, Penyffordd	£260
D. H. Roberts, Hope	240
A. Edwards, Cymmau	234

(The matter is deferred for the present.)

INVERNESS.—Accepted for the erection of a hall and other works at Merkinch public school, for the School Board.—Mr. J. H. Gall, architect:—

New Hall and Classrooms.

Masons' Work.—H. Macvinish, Inverness, £329.
Carpenters' Work.—Robertson & Gillies, Inverness, £476.
Slaters' Work.—Taylor & Son, Inverness, £55.
Plumbers' Work.—W. Urquhart, Inverness, £173.
Plasterers' Work.—D. Dallas, Inverness, £78.
Painters' Work.—J. Cameron, Inverness, £66.
Smiths' Work.—Rose Street Foundry Company, Inverness, £157.

New Latrines and Lavatories.

Masons' Work.—L. Maclean & Son, Inverness, £93.
Carpenters' Work.—Grant & Johnstone, Inverness, £83.
Slaters' Work.—J. Reid, Inverness, £13.
Plumbers' Work.—W. Urquhart, Inverness, £239.
Plasterers' Work.—W. Johnstone, Inverness, £52.
Painters' Work.—T. Tulloch, Inverness, £13.

Additions—Janitor's Lodge.

Masons' Work.—H. Macvinish, Inverness, £93.
Carpenters' Work.—N. Smart, Inverness, £73.
Slaters' Work.—J. Reid, Inverness, £6.
Plumbers' Work.—W. Urquhart, Inverness, £31.
Plasterers' Work.—W. Johnstone, Inverness, £28.
Painters' Work.—S. Fraser, Inverness, £13.

KNARESBOROUGH.—For private street works, for the rural district council:—

E. Long, Harrogate	£1,159
C. H. Dickinson, Harrogate	915
H. Hawe, Killinghall	802

LIMPSFIELD (Surrey).—For the erection of ten working-class dwellings, for the Godstone Rural District Council.—Mr. T. C. Barralet, surveyor:—

Durtnell & Son, Brasted	£2,715
C. & H. Gasson, East Grinstead	2,540
F. Sales & Son, Oxted	2,500
J. Quittenton, Warlingham	2,499
J. J. Pink, Merstham	2,497
Building and Estates Development Company, Bristol	2,450
A. & E. Gunstone, Broughton	2,420
A. Payne, Lingfield	2,390
Head Brothers, Lingfield	2,380
E. G. Stanford, Lingfield	2,350
G. E. Loveland, Limpsfield	2,340
Smith & Sons, Croydon	2,235
R. Love & Co., Sunninghill	2,139
J. Luxford, Forest Row, Sussex	2,112
T. White, Haywards Heath	2,075
N. Smith, Maidstone	1,990
T. C. Gorham, Whyteleafe	1,961
A. Hitchcock, Tatsfield	1,953
J. Brasier & Sons, Limpsfield	1,850
W. Sanderson, Whitehill, Hants	1,844
C. Collings, Dartford	1,750

Surveyor's estimate, £1,845.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. NOVEMBER 13, 1914. No. 1,191.

Minutes of Proceedings.

Private Street Works.

In the well-known case of *Herne Bay Urban District Council* v. *Payne* (L.R., 1907, 2 K.B., 130; THE SURVEYOR, vol. XXXI., p. 564) it was decided that, in preparing a provisional apportionment under the Private Street Works Act, 1892, all premises abutting on the street must be included—not excepting premises which are not chargeable with a share of the expenses because they are exempted either by the Act itself—as in the case of churches, chapels, railways and canals—or for any other reason. From a perusal of the judgment of Lord Alverstone it is clear that one consideration which had considerable weight with the Court in coming to their decision was that "the person who had got to pay was entitled to know how much of the expenses the local authority was going to bear." There are passages in the judgment, however, which seem to indicate that the application of the principle established by this case is not restricted to cases where part of the expense is to be borne by the authority. Take a case, for instance, where it is proposed to make a footpath on one side of a street only, and the authority, having passed a resolution under sec. 10 to adopt the "benefit" principle, apportion the expenses exclusively on the frontagers on that side of the street, intending, when they shall make up the rest of the street, to charge the cost of the footpath on the other side solely upon the frontagers on that side. Such a case is referred to in the *Justice of the Peace* for November 23, 1912 (*Tottenham Urban District Council* v. *Rice and Others*). The premises on this latter side were not included in the provisional apportionment, and it was contended before the magistrates that, upon the authority of the Herne Bay case, the apportionment was bad, and must be quashed. On behalf of the council, however, it was pointed out that, upon the authority of *Twickenham Urban District Council* v. *Munton* (1899, 2 Ch., 603), the magistrates had power, instead of quashing the apportionment, to amend it by including the omitted premises, and this course was adopted. At a subsequent hearing the owners of these premises were represented, and contended that the amount apportioned upon them should be "nil." This was opposed by the other frontagers, and eventually the magistrates apportioned the expenses among all the owners of premises on both sides of the street according to frontage, thus in effect quashing the resolution passed by the council to adopt the "benefit" principle.

This result cannot be said to be very encouraging to local authorities who contemplate the application of that principle. Moreover, it would seem that in this respect sauce for the goose is not sauce for the gander. It has been decided that, unless a "benefit" resolution has been passed by the local authority, the magistrates have no jurisdiction to reduce—or, we presume, to increase—the amount apportioned to any premises in consideration of the degree of benefit to be derived (*Bridgwater Corporation* v. *Stone and Another*, 99 L.T., 806). This seems reasonable enough, but it is rather illogical that the converse should not hold good. If magistrates may not apply the principle in the absence of a resolution to adopt it, it is difficult to see why they should be at liberty to override such a resolution when it has been passed.

* * *

The Surveyors' Institution.

Although the greater part of the inaugural address of Mr. Howard Chatfeild Clarke, the new president of the Surveyors' Institution, was devoted to the important subject of urban housing, it was only natural that in his opening remarks he should have referred to the effects of the present international situation upon the work of the institution. As was pointed out in these columns last week, the war is bound to produce acute distress among the professional classes, and it is earnestly to be hoped that Mr. Chatfeild Clarke's appeal on behalf of the work of the Professional Classes War Relief Council will meet with a ready and generous response from those to whom it was addressed. Statistics show that for some years past the number of dwelling-houses of an annual value of less than £20 has tended to decrease each year, although the normal rate of increase in the population has been preserved. This means that the housing requirements of the great urban populations are not being met by private enterprise. Several reasons may be adduced for this. In the first place there is little doubt that, rightly or wrongly, the famous Finance Act of 1910 had an unsettling effect. Again, the increased cost of building, as regards both labour and materials, has rendered it increasingly difficult to build for the working classes houses which can be let at an economic rent. Finally, the increased cost of money, reflected in the low prices of consols and other gilt-edged securities, has tended to divert capital from housing purposes.

How then are the people to be housed? We

[illegible] could be found in these days [illegible] of building [illegible] in the [illegible] standards of sanitation and surroundings. Unless, however, the cost of building can be lessened, it is evident that some alternative must be found to housing by private enterprise. In some districts something can be done by a reasonable modification of by-law requirements, a question upon which the views are well known. When all these means have been exhausted, however, it is the clear duty of the local authority to exercise their powers under the Housing of the Working Classes Acts to supply the deficiency. We must say in passing that we have considerable sympathy with Mr. Chatfeild Clarke's plea for a consolidation of those Acts, which extend in date from 1890 to 1909. He very aptly pointed out that, although the modern method of legislation by reference may have advantages when a Bill is being passed through Parliament, these are far outweighed by the continued difficulty of interpreting a number of unrepealed measures all dealing with the same subject, which is thereby thrown upon those concerned in their administration. The concluding part of the address dealt with the intimate connection which exists between the housing and transit questions. Much has been done by tramway and motor omnibus development to enable persons to travel to and from the outlying districts of the great towns, but in many cases—particularly, perhaps, in London—this has accentuated another problem—that of traffic congestion. We cannot, however, enter into this matter here. Suffice it to say that no remedy will be really satisfactory that is not conceived on broad and comprehensive lines.

* * *

Extraordinary Traffic: The Amount Recoverable.

When the liability for extraordinary traffic expenses has been established it remains to be determined what amount the highway authority can recover. Sec. 23 of the Highways and Locomotives Amendment Act, 1878, provides for the recovery of the amount of such expenses as may be proved to the satisfaction of the Court to have been incurred by reason of the damage. In *Pool Highway Board* v. *Gunning* (46 J.P., at p. 709) Mr. Justice Field expressed the opinion that the actual cost of reinstatement of the road is not the measure of the sum recoverable, inasmuch as this would leave out of account the effect of the normal wear of the road.

What then is the basis of calculation? The Courts have not answered this question with a very certain voice. In the first place it will be remembered that a condition precedent to establishing a claim for these expenses is the issue of a certificate by the surveyor that, "having regard to the average expense of repairing highways in the neighbourhood," extraordinary expenses have been incurred. Now according to the earlier cases it was not necessary for the Court to go into the question of the average cost of other roads, or to require any evidence on the point, this being a matter for the surveyor to consider before giving his certificate (*Bromley Rural District Council* v. *Chittenden*, 70 J.P., 409). But according to a later case it is a matter to be inquired into by the Court, and specific evidence of such average cost must be given at the trial, failing which the action will be dismissed (*Billericay Rural District Council* v. *Poplar Union*, 1911, 2 K.B., 801). Two of the Lords Justices of Appeal in that case were of opinion that this "average cost" is not merely an item to be taken into account, but forms the actual basis of the calculation. And Lord Justice Vaughan Williams pointed out in support of this view that "if you have to find out how much of the expense incurred is attributable to the extraordinary user as distinguishable from the ordinary use, you obviously have to make a calculation which it is not only very difficult, but almost impossible to arrive at with real accuracy." This decision, it will be seen, is in direct conflict with the Bromley case, which has also been further discredited by a still later decision of the Court of Appeal (*Colchester Corporation* v. *Gepp*, 1912, 1 K.B., 477). It would seem, therefore, that the sum recoverable is not the difference between the actual cost and what—but for the traffic—would have been the cost of repairing the damaged road, but the difference between such actual cost and the average cost, during a similar period, of repairing an equal length of road of the same class.

* * *

The Question of our Timber Supplies.

A conference was recently held between representatives of the architects and builders and the officials of the Board of Trade to consider the question of our timber supplies during the war. As everyone knows, with the Baltic practically closed to navigation, our imports of timber for the present year are much below the average, and the price has risen considerably. Possibly the increase of price has in some localities been much more than was justifiable, but it is generally admitted that an increase of about 15 per cent in the case of fir is warranted by the circumstances. In addition to the difficulties of the present, there is the question of supplies next year, when possibly the conditions as to navigation will not have been improved. Even when the war is ended a shortage of supplies will still have to be faced, for it can hardly be supposed that at the German and Russian Baltic ports, from which we draw the bulk of our supplies, the industry of preparing the timber for export is proceeding under normal conditions. But in considering our position, both at present and in the immediate future, with regard to timber supplies, it must not be forgotten that a considerable amount of timber, and that of the best kinds, comes *viâ* Archangel, from which port—in spite of the non-existence of transports for the much-discussed Russians—a far greater amount of shipping has recently come than is the case in normal times. Also it is worthy of notice that with Baltic or White Sea fir considerably increased in price, the cheaper grades of pitch-pine, or such woods as the Canadian red pine, become about equal in price to fir, and are thus available for ordinary building. This fact should militate against the cost of timber being brought to a higher level than at present. The representatives at the conference appear to have contented themselves with receiving and noting suggestions, one of the most practical of which was that an inquiry into the amount of existing stocks should be made with a view to see whether the shortage of timber is likely to become of serious proportions. Although it seems hardly likely that any drastic Government move will be necessary, it is a good sign that the Board of Trade have this question in view. The action of the Government in regard to the supplies of sugar is ample evidence that those at the head of affairs can be trusted to take drastic steps where necessary to safeguard the interests of the country in the present crisis.

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The Engineer's Library.

In most engineering offices the problem of what to do with the inevitable accumulation of pamphlets and periodicals arises from time to time, even if it is only forced to the front by the presence of an unsightly and untidy

accumulation of such matters. As was pointed out in an article on the subject which appeared in a recent issue of an American contemporary, there are only two reasonable courses to pursue. One is frankly to put all these books and papers into the waste-paper basket, and the other is to arrange and index them so that they may be readily available for use when required. The usefulness of such a collection cannot very well be gainsaid. With regard to the preservation of periodicals, it is pointed out that, while it may be advisable to clip certain articles of interest from miscellaneous journals whose general run of material is only of occasional interest or value, on the whole the practice of clipping and filing only portions of the best technical journals is a short-sighted policy and not an economical or efficient one for an engineering office. No engineering office is prophetic enough to foresee exactly what information needs to be cut out and preserved for future use when one considers the variety of valuable material found each week in the leading technical journals. Moreover, the best journals publish periodical indexes, and are thus readily available for reference when bound. As regards pamphlets, too, the practice of keeping orderly files and indexes will be found a time-saving practice in the long run, even if it be found necessary to allot to one assistant the duties of "librarian" for this purpose.

* * *

A Town Planning Survey.

It has been suggested to the Architects' War Committee that the period of professional inactivity caused by the war might be turned to advantage in the cause of town planning. Accordingly they have drawn up a scheme for a survey of cities and towns for the guidance of town planners. The practical value of such a work would, of course, depend upon the form which it assumed when completed. It is not intended that it shall be the product of the architectural profession alone, but of a combination of professions and services more or less intimately connected with town planning. The list to be employed includes draughtsmen, librarians, artists, surveyors, landscape gardeners, barristers, medical men, and sanitary experts, and the scheme, as drawn up by the War Architects' Committee, of which Mr. Ernest Newton, A.R.A., is chairman, provides for the following groupings: (1) Archæological (sites and buildings of architectural interest; use and preservation of buildings obsolete for their original purposes); (2) Social and Recreative (parks and recreation grounds, baths, libraries, golf links, &c.); (3) Educational facilities; (4) Health; (5) Trade (centres of employment, probable future extensions; character of industries, wages, &c.); (6) Traffic (existing facilities by railway, water, tramway, and roads, and probable future developments in relation to traffic). The project is, as will be seen, sufficiently ambitious to test the energy and resourcefulness of the Architects' War Committee, who, it is stated, intend to carry it through with the aid of local committees.

* * *

A Useful Suggestion.

At a time like the present, when so many individuals at great personal cost have placed their lives—if need be—at the disposal of their country, it is only natural that those who are perforce merely spectators of the mighty events which are taking place should do all in their power to render easier the lot of the men who have undertaken the greater task. Any suggestion having this object in view is worthy of sympathetic consideration, and accordingly we desire to direct attention to a proposal which was made at last night's meeting of the Society of Architects, and which we venture to think might well be adopted by other bodies. In the course of his presidential address, Mr. E. C. P. Monson, F.R.I.B.A., suggested that the society should forego during the period of the war the annual subscriptions of those members who are on active service; and further, that unusual consideration in the matter of subscriptions should also be given to other members in genuine cases of distress due to the war. Most professional societies are compiling Rolls of Honour of those who have answered their country's call, but when the matter is considered, we are confident that they will desire also to give at least this slight material recognition to those who after all are for the time being cut off from most of the advantages of their membership. In these days decisions have to be made quickly, and we venture to hope that the lead given by the Society of Architects will be promptly followed by the several engineering and particularly municipal engineering—institutions.

* * *

Institution of Municipal Engineers.

The decision to hold the forthcoming annual general meeting of the Institution of Municipal Engineers in London, instead of at Chester where Mr. Matthews Jones, the president-elect, holds the office of city engineer—was arrived at only after careful consideration, and is due to the prevailing circumstances. The meeting, which will be held on Saturday, November 28th, will necessarily be curtailed, and the programme will be confined to the transaction of routine business, the delivery of the presidential address, and the discussion of papers. The last-mentioned are three in number, and all deal with important subjects. In the first, Mr. G. Belson Chilvers makes "A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts." This is a question upon which we have not hesitated to comment as the facts in regard to flagrant examples of under-payment have come to our notice, and we shall await with special interest Mr. Chilvers' views on the matter. Mr. Edward Whitwell will contribute a paper on the "Housing of the Working Classes," a subject so wide that we imagine he will find it necessary to deal only with certain aspects of it. Finally, the question of "The Future Control and Maintenance of Rural Roads" will be introduced by Mr. J. S. Wooddisse. Each of these papers ought to produce an interesting discussion. The day's proceedings will conclude with an informal dinner, at which a large attendance is hoped for.

* * *

Street Pavings in Sheffield.

The experience of the surveyor of highways and deputy city surveyor of Sheffield, Mr. W. J. Hadfield, would seem to be that where street traffic is of a nature especially destructive to sett paving, wood proves as economical as granite. Mr. Hadfield thinks that generally the difference between the ultimate cost of these two forms of paving is becoming less, to say nothing of the convenience arising from the silence of wood and its comparative cleanliness. His view is that, for central streets, granite paving must, on account of its noise, now be looked upon as obsolete. In his annual report just issued he points out that, after the old-fashioned water-bound macadam, the most dusty roads under modern traffic are some of those paved with setts. The vehicle which raises most dust is the twin-tyred motor, and on roads over which these pass it has been found impossible, in spite of daily machine sweeping, to keep the joints of the setts clear. Such has been the nuisance, in fact, that during last summer some of the granite-paved roads in the east end of Sheffield were actually treated in the same way as water-bound roads. What say Mr. Hadfield's brother surveyors?

Refuse Disposal.

By Prof. E. R. MATTHEWS, [illegible], Chadwick Professor of Municipal Engineering in the University of London.

[Lecture delivered at University College recently.]

[illegible] Public Health Act 1875 [illegible] that they shall [illegible] the collection and disposal of house refuse.

[illegible] they have [illegible] where [illegible] of. No [illegible] given, [illegible] there is [illegible] in some [illegible] paper has taken the place of [illegible] earthenware, and a fair quantity of vegetable refuse. Not only is this so, but the habits of the people vary. In [illegible] in one part there is a considerable quantity of cinders, in other parts these [illegible] are.

With regard to the collection of the refuse, in most towns this is carried out by the corporation, the council's carts collecting the refuse during the day, and the town being usually divided into districts for this purpose. One visit per house per week is generally all that can be arranged, but two visits per week are preferable.

It [illegible] for the refuse to be collected during the summer months at night, the carts leaving the depot about 11 p.m. and returning about 7 a.m., and this method should certainly be adopted in all health resorts. The disadvantage of this plan, of course, is that the noise of the carts as they rumble through the streets at night is somewhat disturbing to one's sleep, but the advantage of not having them in the streets during the day quite outweighs this disadvantage.

In many towns the collection of the house refuse is let to a contractor, a method which I entirely disapprove, for the corporation can carry out this work more efficiently, and the fact that in some towns where the work was previously let to a contractor the corporation now do the work endorses my view. Not only so, but contractors, when their term for the removal of the contract expires, frequently put their price up very considerably, and that means usually that the work is let to a new contractor who knows nothing of the nature of the work.

In some parts of the country a good deal of the refuse is saleable. Mineral-water bottles, for example, can be sold; tins, if crushed, and put on rail, are bought; paper and cardboard, glass and crockery in some districts have a small value. It is never advisable for rags to be picked out and sold, for these are likely to convey infection.

It has been suggested that in laying out a new city each house should be connected up to a suction main, which would lead to the destructor, and that house refuse should be thrown into a hopper in the kitchen, which would be connected with the main; the refuse would thus be drawn by suction to its destination. Theoretically this is admirable, but many difficulties present themselves in practice.

In some towns it is the practice for the man who [illegible] to bring an empty bin and take away the full one. This is an advantage, for it obviates the nuisance of the refuse being blown about as it is being tipped into the cart or wagon.

VEHICLES USUALLY EMPLOYED.

Ash Carts.—The old-fashioned ash cart is still in use in many towns. This is usually fitted with a canvas cover, which is so arranged that it can be drawn over the piled-up refuse, and lashed down by means of cords. The disadvantage of this method is that while the cart is being loaded the refuse frequently blows off and litters the street, and in a very heavy wind it is almost impossible to prevent this. Carts of this type should certainly be fitted with indiarubber where the tail-board is placed, and it is better that the tail-board should drop into position vertically in a grooved frame rather than it should be hinged.

Covered Carts.—Instead of the canvas cover, ash carts are now made with a permanent cover, which may be raised or lowered as required, and this is a great improvement on the open cart with the canvas cover.

Covered Vans.—The Corporation of Leamington Spa and many other corporations have adopted the covered van in place of the canvas-covered ash cart, and these are admirable where the roads are fairly level, for they are capable of conveying about 3 tons of refuse. In a hilly district two horses would be required, and therefore it is not economical under those conditions to adopt the covered van.

Motor Vehicles.—These are in use in one or two towns in this country for the purpose of conveying the refuse to the destructor, and the power is usually derived from the burning of the refuse. In France this method has been largely adopted. The Municipality of Paris has a large number of motor vehicles engaged in this work. At Havre, Nancy, and other French towns these vehicles are in use. "The Fram" vehicle seems to have met with most favour on the Continent. We in this country have not adopted this method of conveying refuse to the destructor unless it be in an isolated case, but I have no doubt that we shall do so in the near future, although up to the present I have not been satisfied that there is any saving in cost over the ordinary horse-drawn vehicle, chiefly on account of the time the vehicle must necessarily have to stand idle in the street. For other municipal purposes it is admirable.

UNSATISFACTORY METHODS OF DISPOSAL.

Every local authority should consider which is the best and cheapest method of disposing of their town's refuse. In many towns this contains a large percentage of nightsoil, in others it contains none. Here and there throughout the country one finds the town's refuse being tipped in old quarries and disused brickfields. Such methods of disposal are far from satisfactory, for there is a danger of contaminating the water supply, and if not, to have a nuisance of this kind in the district must be injurious. In one of our Midland towns the household refuse is carted to the depot, where it is drawn up an inclined plane on to a strong horizontal screen of 2-in. mesh fixed at a height of 10 ft. above the ground level. On one side of the screen a furnace has been constructed, and into this paper, rags, &c., are thrown and destroyed. Two labourers working on the screen sort bottles and old tins, the remainder of the refuse dropping through the screen. This is received on an inclined riddle of ¾-in. mesh, and the larger ash is deposited outside at the ground level, and sold to market gardeners for use as fuel in rhubarb-forcing sheds. The finer ash which falls through the riddle is deposited in a pit beneath. Tanks are constructed in the yard, and this ash with the addition of the nightsoil is converted into manure, which has a ready sale to farmers in the district.

In some places it has been the custom for the refuse to be taken direct to the farmers in the district, but it is only during certain periods of the year that this refuse is of any use to the farmer, and so, during many months of the year it has to be stored until the farmer is prepared to receive it.

The refuse in other towns is taken by rail direct to the suburbs, where it is used by farmers, market gardeners, and others. The loading and unloading of this is often a great nuisance.

In several coast towns, such as Dover, and other towns which are situated near the coast, such as Sunderland and Newcastle, a part, if not all, of the refuse of the town is taken to sea in barges, and there disposed of, but this method of disposal is a very objectionable one, its disadvantages being—(1) the system costs, with the purchase of barges, &c., as much as a refuse destructor; (2) during an onshore gale much of the refuse already tipped will wash ashore; (3) during a gale, which might last for a week, no refuse could be taken to sea, and therefore it would have to be stored somewhere; (4) the loading of the barges would, no doubt, have to be done from the piers of the harbour, and this would be an

intolerable nuisance. Not only at certain states of the tide, in most seaport towns, would the barges be able to get out of the harbour, but it is very doubtful if the Fishery Board will allow refuse to be tipped in the sea in the manner referred to when they really give this matter their serious attention.

It has often been suggested that a town council should purchase a piece of low-lying land, preferably of a clayey nature, well out in the country, and remote from the water supply of the town, or from any wells in villages, and use this as a tip for the refuse, and that they should purchase a traction engine with trailers to convey the refuse there. The disadvantages of this suggestion are that the rural district council would certainly object to the tipping of the town's refuse in their area, the cost of this method of disposal would be prohibitive, and when snow was on the ground the refuse could not be taken, but would have to be stored in the town for perhaps two or three weeks.

SORTING OF REFUSE IN THE HOME.

It has also been suggested that the refuse should be sorted in the home, and that separate receptacles should be used for receiving—(*a*) waste food, vegetable refuse, &c.; (*b*) ashes and dust; (*c*) other refuse, such as tins, broken glass, paper, &c. While this is very good in theory, in the actual carrying out of an ideal system of this kind many difficulties present themselves. This principle has been adopted in some towns in Germany, but has certainly not proved a success. The local authority can, however, be considerably helped by the housewife, if she will destroy by fire all the organic refuse of the house, so that there will be nothing to remove but ashes. This is an ideal state of things, but unfortunately the public have not yet been educated up to this standard.

DISPOSAL BY CONVERSION INTO MANURE.

There is great difficulty in disposing of house refuse to farmers, owing to the large quantity of paper which it contains, and which the farmer naturally objects to place upon his land. In order to pulverise, release and make it useful as a manure a factory was erected at St. Ouen (Paris) in 1896, and two further factories were erected—namely, at Issy-les-Moulineaux and at Romainville. Shortly after the farmers began to purchase this manure, and found it excellent; but after they had treated their land with it for three or four years they found that its beneficial effect had lessened—the land needed a change. They discontinued using the manure, and the companies failed.

PATENT LIGHTNING DUST MANIPULATOR.

This machine has been brought out by a British firm, and is undoubtedly the best of its kind.

The object of the plant is to treat the refuse so as to enable it to be used as a valuable fertilising agent. The plant may be described briefly as follows: A high-speed centrifugal-force disintegrator, pulverisser, and mixer of a simple construction, it costs much less than a destructor, occupies little room, requires only a moderate power to drive it, and any material capable of pulverisation is instantly disintegrated and pulverised; the machine is certainly a very useful one. The house refuse is tipped by the ash cart in front of the manipulator, and is then shovelled into the hopper of the machine. Almost anything can be treated, and a few seconds after the refuse is discharged into a cart or truck in the nature of a dark-coloured mould or manure. The refuse may contain rags, paper, cinders, glass, pots, bottles, or almost anything.

It was first adopted by the Southwark Borough Council, and one or two extensions of the plant there have since been made. On one occasion at Southwark 6 tons of condemned rabbits from Australia, 5,000 in number, and in their skins, were passed through the manipulator and promptly turned into manure.

Three of these machines are now at work at the depot of the Southwark Council, and a fourth has been installed as a reserve.

Prof. Matthews then proceeded to set out the advantages and disadvantages of using a plant of this kind, and showed that the only really satisfactory method of dealing with towns' refuse was by burning it. He named the points which should be borne in mind by a local authority and its engineer when finally deciding upon a suitable site, and upon any particular type of destructor. He gave many practical suggestions which added to the value of the lecture, and a number of these were illustrated by lantern slides.

The lecture was well attended, those present including Mr. H. Percy Boulnois, M.INST.C.E., and Mr. T. W. A. Hayward, borough engineer of Battersea.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

WAR COMMITTEE'S WORK.

The opening meeting of the session at the Royal Institute of British Architects last week was remarkable for its unusual brevity, the proceedings, which included a short address from the president, Mr. Ernest Newton, R.A., occupying barely half an hour.

On the outbreak of the war the institute formed, with the co-operation of other architectural bodies, a War Committee. "The machinery, being new, has," the president observed in the course of his remarks, "creaked a little; but I think I may say that it is now running smoothly and doing useful work. Subscriptions were also invited for the Prince of Wales' Fund and for relieving distress among architects caused by the war. The institute gave a donation of 100 guineas in August to the Prince of Wales' Fund. £249 11s. have now been collected, and £210 have been forwarded to the treasurer of the Fund as a first donation. We have been able to hand over £591 19s. 6d. for the relief of distress consequent on the war to the Architects' Benevolent Society, which proposes to open a special account for this purpose. The Professional Employment Committee, believing that it is better, if possible, to provide employment than to relieve by means of doles, is arranging a programme of work which might usefully employ men whose ordinary practice has come to a standstill; £462 8s. has been received specially earmarked for this purpose, and the committee hope to receive further financial support, not only from architects, but from the public generally. The Selection Committee is concerning itself in tabulating useful information with respect to special services that may be required by the Government, and in organising assistance to carry on the work of architects who have joined the Forces. They have already done most useful and valuable work."

MUNICIPAL EMPLOYEES AND THE WAR.

HOLBORN'S "SERIOUS POSITION."

Holborn Borough Council, which was among the public authorities who at the outbreak of war agreed that full pay should be allowed to all their employees on active service, had before it at its last meeting a proposal to call a special meeting with a view to the resolution on the matter being rescinded.

Colonel Smith said the resolution placed the borough in a serious position. When it was passed they did not know the facts. Since that time the Government had advanced separation allowances on a liberal scale, and women, according to the number of children, received up to £1 2s. a week, independent of their husband's Army pay. Consequently they were very much better off than when their husbands were at work.

A Voice: So they should be.

Councillor Fitzroy Doll said the Metropolitan Water Board were giving its men full pay. (Cries of "It is an extravagant body.")

Councillor Fitzroy Doll: And most private firms are also paying full pay. (Cries of "You are wrong!" "Half pay!" and "No, no.")

Ultimately the question was referred to the Law and Parliamentary Committee to inquire into how far the resolution could be altered.

Goods from Hostile Countries.—At the last meeting of the City of London Corporation the following motion was carried *nem. con.*: "That His Majesty's Government be asked forthwith to obtain power for the determination of contracts with companies for the supply of goods imported from any country with which this country is at war, or manufactured or partly manufactured in any such hostile country, and for the determination of contracts with companies which are or were, on and subsequently to the first day of January, 1914, under the management of, or a majority of whose directors or shareholders are or were, during the said period, born subjects of any such hostile countries."

Camp Sanitation.

(4.)—OBJECTIONABLE ORGANISMS AND MICRO-ORGANISMS AND THEIR DESTRUCTION.

By G. BERTRAM HARTFREE, [illegible], Engineer and Surveyor to the Alton, Hants, Urban District Council.

A [illegible] of the [illegible] [illegible] [illegible]

hairy parts of the body (but not the head), and the eggs are found on separate hairs at the end furthest [illegible]

[illegible] death. [illegible] the eggs are said to remain [illegible] for a month.

[illegible] sleep where others have slept before; this should be [illegible] clothes as often as possible, and prevent clothes being mixed with that worn by others.

To destroy vermin in the head, in addition to fine combs, paraffin oil, benzine and turpentine are very useful; tobacco juice is also said to be very effective. For the body louse, heat is a very destructive agent, [illegible] ing affected parts may lead to further trouble, as the pests are stated to be "carriers" of various infectious diseases.

"[illegible]
[illegible]

These well-known lines of Dean Swift's appear to [illegible] that their tormentors are getting an equally warm time; but as vermin are "carriers" of the micro-organisms that cause infective diseases, the presence of their smaller "fleas" adds to their danger.

The steam disinfectors in use in all well-equipped hospitals are, of course, the best means for the destruction of micro-organisms, but in camps and on the field some effective substitute must be obtained.

In designing a portable disinfector three points [illegible] a steam or chemical agent; (3) lightness and portability.

A small but useful steam disinfector is described in the Red Cross Manual No. 4. This consists of a deal box lined with felt covered by zinc sheeting. Steam is generated in a wrought-iron boiler, and conveyed to the box through a flexible tube. Heat is obtained from a wood fire in a trench.

For chemical disinfection any tight-fitting box may be used; in the absence of a sound chest, air-tightness can be obtained by pasting paper over the cracks. Sulphurous acid, in either of the many forms on the market, or formaldehyde by the use of an Alformant lamp, may be adapted for use inside.

Two formaldehyde machines that are suitable for use when this disinfectant is required are the Trenner-Lee and the Lingner generators, both of which have the advantage that they can be used outside owing to flexible tubes that connect the machines through an aperture to the interior of the boxes or rooms. The Lingner type, with which I have had much experience, is considered by medical experts to be very effective. Heat is provided from methylated spirit burning in a ring containing asbestos. Immediately over the burner is a chamber containing water, which is converted into steam and forced into a second chamber containing formalin. About five minutes are taken to obtain the necessary temperature, and in ten minutes an area of 1,000 cub. ft. is filled with gas. Unfortunately the machines with which I have had experience are of German make, and I trust the vendors will adopt the suggestion made several weeks ago, and put a machine of British manufacture on the market.

When machines are not available, an efficient method, described in Notter & Firth's "Hygiene," may be used. This consists of pouring liquid formalin quickly upon fine crystals of permanganate of potash contained in a suitable metallic vessel. A vigorous action takes place in a few seconds, accompanied by a strong ebullition of the liquid and sufficient heat to form a large quantity of steam.

This method has a further advantage for camp purposes, as dry formalin may be used. A working solution can be made from the ordinary tablets crushed to powder and placed in hot water, which should then be brought quickly to boil, and the hot solution used in the same manner as the common liquid form. The authors state that from their experiments 100 tablets dissolved in a pint of water makes a solution equal to a half pint of ordinary formalin.

Several years ago, for purposes of adapting this method, I designed a cabinet which was brought to the author's notice. Colonel Firth, R.A.M.C. (former Chief of Aldershot School of Sanitation), stated at a meeting of the Southern Branch of the British Medical Association that where sterilisation could not be employed he believed this cabinet would be very useful, and 5 oz. of permanganate to 10 oz. of formaldehyde would create fumes sufficient for 2,000 cub. ft.

The cabinet was made to the following specification: All wood to be the best selected and seasoned [illegible] or any other defect. No panel to exceed 8 in. in width or 18 in. in length. All stiles and rails to be 2 in. by 1 in. finished dimensions. Panels to finish ¼ in. in thickness and fit in grooves not less than ¼ in. in depth. The centre panel at back to be glazed with one sheet of 21-oz. glass. Sides, back, front and top to be carefully framed, glued and wedged. Bottom to be 1 in. in thickness, glued and screw-jointed. The whole to be carefully fitted with rebated joints made by glueing and screwing ¾-in. fillets. The top and bottom to be supported by sides, the back and front to fit between sides. Sides, back, top and bottom to be well secured together by stout screws, well greased before insertion and provided with brass caps. The front to be provided with four stout thumbscrews and sockets. A hole to be cut in bottom and an iron container to be fixed by an airtight joint. Connect an iron pipe, ¾ in. internal diameter, bend a brass cock to zinc cylinder outside cabinet. Fix stout hooks to underside of top. Provide two shelves consisting of pine 2 in. by 1 in., framed like a sash with fine mesh wire covering. Shelves to rest on wood fillets and be easily removable.

This cabinet is sufficient for the disinfection of an ordinary-sized mattress suspended from the top. By inserting the wire shelves, smaller articles can be treated.

The method of operation is to place potash crystals in the iron container, hang up goods to be disinfected, and secure the front with thumbscrews. Open the brass cock at back and pour in formalin, after which the cock must be closed to prevent gas escaping outwards. Successful formation of gas can be seen through the glazed panel.

For transport the cabinet may be unscrewed and packed in a space 5 ft. 10 in. by 3 ft. by 8 in. Fig. 1 is a section through a cabinet intended for formalin and permanganate of potash disinfection, and Fig. 2 shows the same type of cabinet intended for use with a formaldehyde generator in 1908. I had one of the former constructed by a local cabinet maker for the sum of £5, and it is still in use.

Ratione Tenuræ Roads.—At the last meeting of the Executive Committee of the County Councils Association the Highways Committee reported that they had given consideration to the following resolution, passed by the Annual Conference of Rural District Councils: "That, in the opinion of this conference, legislation is required to deal with the question of *ratione tenuræ* roads, either by defining the principles of the liability of the present occupiers, or by giving highway authorities power to take over such liability upon compensation to be fixed by a valuation, such compensation being paid by an annual sum over an agreed period of years, or in a lump sum down, at the option of the person liable." It was resolved that the Rural District Councils Association should be asked to explain in what respects they consider that the existing law is not sufficient.

Sewage Disposal at Bury.—In his annual report on the treatment of sewage and destruction of refuse for the year ended March 31st last the manager of the Bury sewage works, Mr. J. Bolton, states that the cost of purifying the sewage was £3,127, against £3,054 last year, an increase of £73. This increase is entirely accountable for in repairs to buildings and chimney. The cost per head of population works out at 12·69d., against 12·42d. last year. The volume of sewage treated through the precipitation tanks and filters was 885,003,000 gallons, and 220,000,000 gallons, estimated from frequent gaugings, through the storm-water tanks, making a total of 1,105,003,000 gallons, against 1,136,056,000 gallons last year—a decrease of 31,053,000 gallons. This decrease is brought about owing to the lesser rainfall in the year 1913. The average daily flow through the tanks and filters was 2,424,665 gallons, an average of 41·09 gallons per head of the population per day. This is exclusive of the amount passed through the storm-water tanks during wet days.

The Surveyors' Institution.

MR. CHATFEILD CLARKE'S PRESIDENTIAL ADDRESS.

On Monday evening last Mr. Howard Chatfeild Clarke delivered his opening address as President of the Surveyors' Institution.

In some introductory remarks on the course of the war Mr. Chatfeild Clarke said it was pleasing to feel, as the representative for the time being of those professions, to see that surveyors had not lagged behind other Englishmen in their eagerness to serve their country. The lists which had been published, though necessarily incomplete, were an indication of the manner in which the profession had responded to the call, and this was corroborated by the number of candidates for the institution examinations who had felt called upon to give up the desk for the field, and had withdrawn from the examinations at no small inconvenience to themselves.

The distress which must inevitably be caused by a state of war, and especially by a war involving so great a demand upon our resources, would be deep-rooted and widespread, and must, he feared, be felt in no class of life more acutely than among the professional classes. To those of their brethren who most felt the pinch, all who were in a position to do so would feel bound to put up the hand of fellowship and help them to tide over the period of difficulty. For this purpose he need not say that money would be required, and he trusted that a generous response would be made to the appeal which was being issued on behalf of their Benevolent Fund, upon which the demands must necessarily be great. Those who undertook military service offered freely their lives for their country, and we who lived in security at home through their devotion must emulate their sacrifice by doing what was in our power to assist those who suffered from the effects of the war. A body known as the Professional Classes War Relief Council, composed of representatives of the great professional societies and bodies interested in social work, had been organised for the purpose of giving advice and co-ordinating the work already undertaken by the existing benevolent funds. The administration of these funds would remain entirely in the hands of those at present responsible for them, but it was hoped that the new council would prove of great value in supplementing their work.

Continuing, the president said his own work lay in urban areas, and he proposed therefore to confine his remarks more particularly to the problems which confronted those responsible for the better government of our teeming centres of population.

URBAN HOUSING.

Of the many questions to which urban surveyors must devote their thoughts—housing, public improvements, transit, sanitation, and so forth, all of which were so intricately connected that it was almost impossible to deal with one without reference to the others—the housing of our working population was the most important, and in many ways the most difficult. The two main agencies for providing housing accommodation for the working classes were the private investor and the local authority, while between these came charitable bodies, public utility and similar societies, and co-partnership associations. But by far the largest number of the houses of this class which were built were provided by private enterprise, a recent estimate placing the proportion as high as 99 per cent. It was therefore important to consider whether it was likely that the needs of the community would continue to be met through this agency.

Official figures showed that, during the past ten years the number of dwelling houses under £20 in annual value erected yearly had tended to decrease, although with the increase in the population remaining normal one might have expected a growth in the demand for houses parallel with the improvement in the general standard of living and better knowledge of sanitation, which should result in a reduction in the average number of persons per room. It would seem therefore that this form of investment was proving less attractive to the ordinary investor than was formerly the case, and a number of reasons for this were not difficult to find. In the first place there was the effect of the 1910 Finance Act, which it could not be denied had been considerable, in that, rightly or wrongly, builders, mortgagees and others had been unsettled by the fear that their profits or their security might be unnecessarily affected. It would seem probable that the great falling off in the number of houses built during 1910-11 must to a large extent be attributed to the feeling that, by the operation of the Statute, this class of building had become more speculative, and this deterioration in the safety of the investment had been accentuated by the increase in the cost of building.

PRIVATE ENTERPRISE.

A third influence affecting the flow of capital for housing purposes was the cost of money. Housing accommodation for the working classes had in the past been provided largely by the speculative builder, who, in spite of the abuse which had often been showered upon him, had in fact carried out a useful public work in this direction. But, as a rule, his capital was small, and his operations had been carried on mainly by means of borrowed money, with the result that the interest he had to pay had a marked effect, in the first place on the price he must obtain for the houses he built, and in the second on the rent at which they could be let. For example, an additional 1 per cent per annum on the capital employed in the erection of a house costing £250, inclusive of land, proportion of road construction and sewering, would necessitate an additional 1s. per week in rent, and unless that extra sum were likely to be obtained without much difficulty there would be a strong inducement for the capital to discover another outlet. There was also the undoubted effect which the great and continued increase in the burden of the rates must exercise upon building.

Apart from a small minority holding very advanced views, all would, he thought, prefer to see the provision of houses for our people undertaken by private enterprise, but few would agree that an attempt should be made to attract capital to this class of investment by reducing the standard of sanitation and amenity which has now been reached. Up to sixty years ago little control had been exercised over building; back-to-back houses were permitted, facing ill-ventilated courts, and conditions prevailed in parts of almost every large town giving rise to death rates in those particular districts quite double those found in the more favoured parts. There was now a tendency to place greater and greater responsibilities upon the builders and owners of house property, and while it was impossible to say that this should not be done a word of warning might not be out of place to the effect that such restrictions should be fair, reasonable, and free from any suspicion of faddism.

Private capital was a valuable ally, but at the same time it was one which was easily frightened; it was therefore worth an effort to secure it on the side of those who wished to see the people well housed. This was recognised by Mr. John Burns, who, in a circular to district councils issued at the end of 1912, said: "By-laws with respect to new streets and buildings are intended to operate in the interests of the inhabitants and to prescribe reasonable standards to which building development may fairly be called upon to conform with a view to securing stability, protection from fire, and healthy conditions, and it is obviously undesirable that the by-laws in any area should afford any ground for the suggestion that they are either unnecessarily restrictive or obsolete in character."

That circular, he ventured to think, was penned in the spirit which should govern all the relations between builders and owners on the one side and the sanitary authority on the other, whether touching upon by-laws, the provisions under the Town Planning Acts, or other matters. Every facility should be given for introducing new and cheaper methods of construction, and he was inclined to think that, in the less closely populated districts at any rate, so long as habitations were warm, dry, well ventilated, and sanitary, the requirements of the local authority should be looked upon as being fulfilled; and that too great weight should not be attached to the theory of structural uniformity, espe-

cially those occupied by the working classes, quickly became out of date, and, subject to the above essentials, it was desirable that it should be possible to "scrap" them when that time arrived, without too great a loss of capital.

THE REAL DIFFICULTY.

So far as it was possible to foresee, it was unlikely that any real difficulty would arise with regard to the provision of the better class of workmen's dwellings capable of being let at rents which although varying in amount in different towns, paid a reasonable interest on the outlay. The real difficulty existed in providing house room, up to modern sanitary standards, for those who could not pay rents sufficient to meet requirements, and as it was essential that the people shall be housed, if one source of supply failed another must take its place.

Under the Labouring Classes Lodging-house Act, 1851, local authorities were first permitted to purchase, lease or erect lodging-houses for the working classes, and legislation had from time to time added to these powers, culminating in the Housing of the Working Classes Acts, 1890 to 1903, and the Housing, Town Planning, &c., Act, 1909. He should like strongly to urge the consolidation of those measures. The modern method of legislation by reference might have advantages when a Bill was being passed through Parliament, but the continued difficulty of interpreting a number of unrepealed measures all dealing with the same subject, which was thereby thrown upon those concerned in their administration, far outweighed the earlier and temporary advantage.

STREET CONGESTION.

Proceeding to discuss the question of travelling facilities in the great towns, the president observed that the development of tramways, railways and motor omnibuses had not been instrumental in relieving the congestion of the streets; indeed, in some cases where slow and quick traffic both made use of the same routes the difficulty had been increased. Bold schemes for future street widenings and for cutting additional wide new thoroughfares were often formulated, and would not lack support were it not for the financial questions which they raised; but it was clear that, however much we might wish to see them carried out, the cost would in some cases be prohibitive, while in others it could only be borne by dividing comprehensive schemes into parts and dealing with a portion only at a time.

The congestion at cross-roads was a difficulty which street widening alone could not prevent. He believed it was Sir John Wolfe-Barry who suggested sinking roads at junction points, so that one stream of traffic would pass over the other, and a number of crossings occurred to the mind where such a scheme might be carried out at reasonable cost, and would afford much practical relief. Indeed, subject to the engineering difficulties being overcome, it seemed possible that the solution of the problem in congested districts such as the City of London, where the value of property was so great that comprehensive street improvements became impracticable through the enormous cost, might be found in an extension of Sir John Wolfe-Barry's scheme by the formation of sunken roads under the existing streets to take the slow-moving traffic. He felt confident that the cost would be infinitely less than that of widening important thoroughfares for any considerable distance.

TOWN PLANNING.

To bring a word upon the subject, the president submitted the table in next column, prepared by the Local Government Board up to September 30th last, showing the town planning schemes proposed or under consideration at the present time.

It was satisfactory to see that the importance of this subject was not being overlooked, and at the same time that schemes were not being rushed through without due and proper consideration. The conferences which were now annually arranged between representatives of local authorities for discussing details in connection with town planning, and the principles which should govern that art, must prove of immense value in ventilating their subject, and in preserving our sons and grandsons from some of the disabilities under which we now suffered.

On looking back over what he had written, he felt that his remarks were open to the criticism that he offered no definite solution for the problems which he discussed; but his reply would be that great social questions could not at once be solved by a stroke of the pen, or even by legislative action, however well considered. Improvement could be effected only by progressive development and by the gradual amelioration of such conditions as became the subject of condemnation. Indeed, the continuous rise in the standard of living which could be followed throughout history, and which had become more marked during the past century, showed them that each generation set up ideals which it could never reach, as, happily, the ideals themselves continued to advance. He was therefore consoled at his failure to find a final solu-

Stage reached.	Number of schemes.	Number of local authorities.	Acreage of areas dealt with.
Schemes finally approved by the board	[illegible]	2	9,968
Other schemes prepared by local authorities and submitted to the board for approval	3	3	161
Schemes authorised by the board to be prepared or adopted by local authorities	73	3	10,920
Applications for authority to prepare schemes under the consideration of the board	30	27	67,888
Total	109	75 separate local authorities.	166,975

Other cases in which the board have information that the preliminary notices have been given with a view to applications being made to the board for authority to prepare schemes	22
Other cases in which local authorities are known to the board to have had the matter under consideration	116
Number of separate local authorities included under all headings of the table	204

tion of these questions, and should be more than satisfied if any thoughts he had put before them bore fruit by stimulating a growth in the interest taken in these subjects among the coming generation, in whose hands the future advance would rest.

PAST-PRESIDENT'S DEATH.

Before resuming his seat the president said he had been much grieved to hear of the sad death of his predecessor in the chair. Mr. Edward Woolley was well known to them all, and he knew that they would feel how great a loss the institution had sustained in his death. He was a straightforward English gentleman, much respected and beloved by all who were thrown in contact with him, both in business and in personal matters, and he left behind him an example any man might wish to emulate. Thirty years ago Mr. Woolley's uncle was president of the institution, and he knew what a pleasure it was to Mr. Woolley to have succeeded to the chair nearly a generation afterwards. Their heartfelt sympathy was with his sons in their great loss, and their earnest hope was that future generations of the same family might be forthcoming in their day to carry on the noble tradition set by their predecessors.

Official Fire Tests with Treated Wood. The British Fire Prevention Committee have just issued their report No. 193 regarding a test carried out on July 1, 1914, with a match-boarded deal partition, where the deal was impregnated by a proprietary process with the object of making it fire-resisting. The partition comprised studs with ⅝-in. grooved, tongued and beaded match-boarding on both sides, and it measured 10 ft. wide by 9 ft. high. The test was conducted under the committee's usual conditions, and was a forty-five minutes' test at temperatures that rose to 1,630 deg. Fahr., whereupon water was applied from a steam fire engine. The main features in the official "Summary" of the test are that smoke appeared freely through several joints after thirty-eight minutes, and that after forty minutes' scorching appeared at several joints, and that after forty-four minutes a glow was seen at four points. Upon the application of water, water came through several of the vertical joints. The fire resistance was thus considerable for woodwork, although the minimum classification as to such a partition affording "temporary protection" under the British Fire Prevention Committee's Standards—necessitating resistance for forty-five minutes—was not obtained by a few minutes.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain
Your free will, freely of his own
Concerning anything, or anybody
—MASSINGER "The Fatal Dowry," Act ii. 2

THE TRAINING OF MUNICIPAL ENGINEERS.

To the Editor of THE SURVEYOR.

[illegible] is it possible to estimate the value of the education or training that a young fellow will receive merely [illegible] which he serves as a pupil.

Until one can guarantee that appointments are always made according to engineering ability, and not to influence or push, you will continue to find [illegible] reputations and positions depend upon the ability and work of their staff rather than on that of their own. On the other hand, it does not follow, because a man occupies the position of surveyor to a small town or district, that he is therefore without engineering experience or the ability to train young engineers, as Mr. Platt, from his evidence, appears to think.

May I give two cases in support of my argument, though I do not pretend that they are to be taken as average examples of what is to be found in large and small towns? They do, however, give point to my contention that it is unsafe to make too wide generalisations.

When a young man I was an engineering assistant in a town considerably larger than that over whose engineering destinies Mr. Platt so ably presides. The borough engineer was a member of the Institution of Civil Engineers, and, having a capacity for window dressing, was, with the aid of a large number of able assistants, able to make a very striking show of works carried out under his control. He had, like so many present members of the Institution of Civil Engineers, never received any training as an engineer, having started life in a builder's office, then for a few years followed the useful if not very successful trade of a purveyor of meat, afterwards became a road surveyor to a rural council, and ultimately borough engineer to a town of well over 100,000 inhabitants. Like Queen Elizabeth, he owed his success to his counsellors in the shape of his staff, and his very successful career only ended when he tried to dispense with their services, and attempted some engineering work on his own initiative. Every member of his staff had a shrewd idea of his abilities, and it is quite certain that not one of them would have cared to article their son to him. Still, the outside public, gulled by the string of letters after his name, and the importance of the town of which he was borough engineer, almost fell over one another in their eagerness to place their sons with him as pupils. At the time I was in his office he had six pupils, and his method of training them was evidently framed on the Pecksniffian model. The only training I ever heard that he gave any of his pupils was to put into their hands a volume on "Building Construction," with the margins plentifully marked with pencil lines, and tell them "to read that, for he had been all through it." I don't think he had ever set up a level in his life, and I am confident he could not read one brass on a chain from another. As a consequence, although he had a number of smart lads in the office, there is only one—and that, perhaps, not a brilliant example—who has made any success as a municipal engineer.

At the other extreme almost I may cite the case of a man who is surveyor to a small town, and who is quite "outside the pale" according to Mr. Platt, as he is not even a "small corporate member of the Institution of Civil Engineers." He has had, in the course of nearly twenty years' experience as a surveyor, some four pupils. All these four have passed the examination of the Institution of Municipal and County Engineers, and three of them got through the examination at the first attempt with no coaching beyond what they got from the surveyor. As a matter of fact, it was only the youth who studied under a coach who required a second attempt. One of these pupils also passed the Institution of Civil Engineers' examination for associates at the first attempt as soon as he reached the age of twenty-five, and again without a coach. I think this is a sufficient proof that [illegible] he agrees, with Mr. Brodie, is an examination of a far more practical character than that of the Institution of Civil Engineers, and an examination that many men who pass the Institution of Civil Engineers' examination could not pass.

What I cannot understand about Mr. Platt, and many other members of the Institution of Civil Engineers, is why they should try to belittle their own special engineering institution—the Institution of Municipal and County Engineers—which is admitted on all hands to be of far greater practical value than the larger institution. One does not find the Institution of Electrical Engineers doing this, and I see no reason why municipal engineers should not look upon their own institution as being equal in importance to that of any other.

May I say how warmly I appreciate the broad views [illegible] Mr. Brodie passed [illegible] the committee, and add that I think the thanks of all municipal engineers are due to him for the able manner in which he stated their case?—Yours, &c.,

M.I.M. & Cy.E.

To the Editor of THE SURVEYOR.

SIR,—I have carefully read the whole of the evidence and schedule prepared by the Institution of Civil Engineers, and am personally of opinion the same is both interesting and instructive, since both Mr. Platt and Mr. Brodie are gentlemen at the head of their profession, and absolutely impartial. One point, however, that appears to me to have been entirely lost sight of in the schedule drawn up by the special committee with respect to the training of the municipal engineer is the entire absence of any reference to legal knowledge.

In my opinion, every municipal engineer is so continually involved in legal questions that it is most important he should have a groundwork of legal knowledge, which will enable him entirely to avoid the risk of accidentally involving his council in litigation.

The second point which [illegible] with reference to small districts. Personally I am of opinion that a hard-working pupil trained in a small district, with a limited staff but a capable chief, is often more fitted to cope with the multifarious duties devolving upon the municipal engineer than the pupil in a larger district who is only an average worker.

I have personally had experience with good and bad pupils, and with men holding B.Sc. degrees, and I appreciate the difficulty set forth by Mr. Brodie in regard to the latter thinking certain office work utterly beneath their dignity, whereas the youth who enters the office from a public school, preferably after passing the matriculation examination only, realises that he must begin at the bottom rung of the ladder, and he thus obtains the benefit of office routine and practical detail more than the former.

In every case before taking a pupil I have warned the parent that it is only in the very large cities that every class of the work is fully dealt with, but that I will enable the pupil to have as wide an experience as possible while in my office, and will give him ample facilities for visiting other municipal works, and continuing his studies at evening technical lectures. My experience has proved that the pupil who takes advantage of this advice becomes very efficient, while the one who neglects to profit by it is a failure, and does no credit to himself or to his old chief.

I personally had the opportunity of having two years' experience with contractors in the workshops and upon outdoor works prior to becoming articled, and such period has proved of considerable benefit to the councils I have had the honour of serving.

My experience proves that every pupil or assistant should make himself not only efficient for the particular work upon which he may be temporarily engaged, but should continue his studies and qualify himself for a higher sphere, so that when a vacancy occurs at a better salary, there is no doubt as to his promotion.

Personally I am deeply indebted to my old chief, Mr. O. Claude Robson, of Willesden, for the greater

[illegible] I [illegible] I [illegible] I am [illegible] [illegible] struction that the average municipal engineer may have time to give.

I have endeavoured to be as brief as possible in the above observations, although the subject opens [illegible]

I am a strong believer in the necessity of a *viva voce* [illegible] ments and abilities, and as I have been examining students for nearly twenty years, I speak with some authority on this matter.—Yours, &c.,

E. Willis,
[illegible]

Town Hall,
[illegible], W.
November 4, 1914.

To the Editor of The Surveyor.

Sir,—I was very interested in the report which I received on the above subject from the Institution of Civil Engineers a fortnight ago; and also in the letter of "A Small Corporate Member" in your last issue. [October 30th.]

In my case, a non-university town of 80,000, I insist that the intending pupil should be so far advanced as to have passed the Oxford and Cambridge Higher Local Examination, qualifying for studentship of the Institution of Civil Engineers, and that he shall also during his pupilage attend evening classes at the local technical college. If this were a university town, the standard I should set would be much higher, but a youth who has obtained an engineering degree in a university [illegible] pupilage in a town so much less than the one he is accustomed to. Every pupil is given full facilities for seeing and taking part in everything that is being done, and during his last year he is allowed to have charge of works from inception to completion, including drawings, quantities, supervision, and measuring up.

The problem seems to be one of "differentials," though perhaps not solvable by the calculus. There is—(*a*) The Engineer: He may be a man well worth his salt, able to organise and to teach, knowing his work, and doing it well; or he may be the man already described by Mr. Platt, "not qualified to teach, and his office not worth bothering about." (*b*) The Pupil: A youth studious, willing, and desirous of getting a practical engineering training, and obtaining the full value for the premium that his people have paid; or the youth referred to by "A Small Corporate Member," "an unmitigated nuisance who would neither work himself nor let anybody else work." (*c*) The Office: One so carried on that the assistants and pupils are put on to every class of work in turn as necessity demands; or one where the different classes of work are specialised (kept in watertight compartments, so to speak), and the assistants are kept on the same class of work year after year. And all the varying shades and grades in between these extremes in each of the factors!

Among the fables which appeared, under the title of "Æsop Modernised," in your columns some fourteen months ago there were two bearing very much on this side of the question (see pp. 319, August 29th, 1913, and 535, October 10th, 1913).—Yours, &c.,

H. Gilbert Wright.

Grimsby.
November 7, 1914.

To the Editor of The Surveyor.

Sir,—While I agree that "A man doing small work, if he is doing well, is often a good man," a pupil requires something more in being articled than being placed under a good man. The good man also should be able to offer the pupil sufficient experience and the backing of a known name.

From the point of view of a parent or guardian selecting a municipal engineer as the master for his son or ward, I think he will be distinctly on safer ground in choosing a member of the Institution of Civil Engineers than otherwise. He should further ascertain what experience will be available under [illegible] more varied in large towns than small, although in some large towns the departmental system discounts their other advantages.—Yours, &c.,

Arthur L. Collins, M.Inst.C.E.,
M.I.M. & Cy., &c.,
City Engineer, Norwich.

November 4, 1914.

THE FUNCTIONS OF A MUNICIPAL ENGINEER.

To the Editor of The Surveyor.

Sir,—I [illegible] the report of Prof. Matthews' lecture on "The Functions of a Municipal Engineer" with interest, but am not clear upon one or two points.

(*a*) Why should the depth of a reservoir be limited to 30 ft., especially since Prof. Matthews later speaks of 35 ft.?

(*b*) Would Prof. Matthews consider a concrete composed of 4 parts gravel which had 33 per cent voids, and 2 parts sand which had 30 per cent voids, a well-graded concrete?

(*c*) My experience, after testing hundreds of concrete tubes, laboratory made and job made, is that 2,000 lb. per square inch at thirty days is a very high figure to expect, and cannot be obtained except with the best of aggregates, correctly proportioned, and an absolutely first-class cement; 1,500 lb. would be nearer for average concrete.

(*d*) According to my figures, a vertical concrete wall to withstand a 10-ft. head of water, using 600 lb. on concrete, and considering the wall restrained top and bottom, would demand a thickness of 8 in., to include covering for steel. I take it that, while "it is usually desirable to build counterforts of buttresses back of the wall," this is not absolutely necessary.

(*e*) Prof. Matthews says the weight of water on the heel of a cantilever wall should be neglected in design. This is probably considered necessary in case of possible upward water pressure. Is this true?

(*f*) A strength of 1,050 lb. per square inch at seven days was spoken of in the lecture. Is this the correct figure?—Yours, &c.,

H. C. Johnson,
Lecturer on Reinforced Concrete.

Engineering Department,
University College,
Cork.
November 9, 1914.

Corporation's Claim under Housing Act.—At Leamington Borough Police Court last week B. Dawson, 25 Regent-street, was the respondent in a claim made by the Mayor and Corporation of Leamington for the payment of £5 for work carried out under the Housing of the Working Classes Act. The town clerk (Mr. Leo Rawlinson) said the claim was for demolishing a house at the back of 3 Grove-place, in respect of which a closing order was made in February, 1913. The demolition order was made in July, and as the defendant had not done the work the local authority had the work carried out by contract for £5 in November. The Bench ordered Dawson to pay the claim, £5, and costs 9s. 6d.

Belgian Engineers.—At the ordinary meeting of the Society of Engineers held on the 2nd inst., the president, Mr. H. C. Shenton, made special reference to the presence at the meeting of about twenty Belgian engineers, and on behalf of the society gave them a hearty welcome. M. Pierre de Thier, membre de l'Association des Ingénieurs de Liége, who took part in the discussion, prefaced his criticism of the paper ("Uses of the Hydraulic Mining Cartridge," by Mr. James Tonge, M.I.Mun.E.) by a courteous appreciation of the hospitality offered by the Society of Engineers to their Belgian confrères. The offices of the society at 17 Victoria-street, Westminster, are open daily from 10 a.m. to 4 p.m. (Saturdays 10 a.m. to 1 p.m.), and Belgian engineers who are now in England on account of the war are cordially invited to apply to the secretary when they are in need of any information. Those who are unable to call are invited to send their names and addresses to the secretary so that they may be in touch with their colleagues and receive invitations to the meetings.

SHEFFIELD'S HIGHWAYS AND SEWERS.

DEPUTY CITY SURVEYOR'S REPORT.

[illegible] Mr. W. J. [illegible]

[illegible] £1,450,[illegible] [illegible] £1,[illegible]

In order to judge of the effect of work done under [illegible] Board grants, Mr. Hadfield says it is only [illegible] to examine critically the roads and compare the [illegible] surfaces of these with the old macadam surface that still exists in some of the [illegible] roads. A table in the report shows [illegible] the extension of the city boundaries in 1901 the expenditure on highways and sewers, and what it amounts to in the way of rates [illegible] in the period. There has been a [illegible] increase in the rates of expenditure [illegible] since the city was extended. The total is now £[illegible] in the £, compared with an average of £0.[illegible] in the period of fifteen years, the maximum having been 19.2d. in the year 1901-2.

It appears that bouldered streets have been re[illegible] during the year by more than 2½ miles, a rate of progress which, if maintained, will result in [illegible] of this class of paving disappearing at the end of another five years. Water-bound macadam has been reduced by about 10 miles, and tar[illegible] has increased to the same extent.

Wood paving has been extended from 12 to 12½ miles. About 1,000,000 wood blocks were until recently considered an average year's consumption in Sheffield. During the last two years, however, 3,341,784 new blocks and 531,470 renovated blocks—[illegible] 3,873,254 blocks, [illegible] the total quantity—have been laid.

TAR-MACADAM.

The quantity of tar-macadam mixed during the year was 22,205 tons—a total well in advance of any previous record. In last year's report many details were given with reference to the use of this material, and subsequent experience has not only confirmed, but emphasised the favourable conclusions then recorded. On three of the principal roads leading out of the city about 6 miles of tar-macadam have been laid at different times, some as long ago as 1911. Except in two places where the foundation gave trouble—and the extent of this was very slight—nothing has since been done except to tar and gravel the surface—in some cases even this has been unnecessary—and almost throughout the roads are in as good condition to-day as when they were laid. Mr. Hadfield has little doubt that in a few more years the saving in maintenance will have paid off the initial cost of the tar-macadam, while in the meantime the public is having the use of roads out of all comparison with those which previously existed. In dry weather there is practically no dust, and there has not been a load of mud to remove from any of these roads since they were tar-macadamised. In two other roads—over which there have been [illegible] tar-macadam has now been laid in part for eighteen months, in part for a year. The sections laid eighteen months ago have sustained the whole of this traffic in addition to the other traffic using the road, and so far with complete success.

A trial of asphaltic pavement has been made in certain thoroughfares. "The paving," says Mr. Hadfield, "is particularly clean, and although a few complaints were received during the first few days of its use that it was slippery, careful observation of the traffic proved that accidents were almost non-existent. The surface of this material [illegible] a reasonable foothold for horses, without creating dust. At the time of writing this report arrangements were being made for laying further areas of similar pavement. In one street the asphaltic sur[illegible] the top of the existing [illegible] paving. This pavement was [illegible] complaints during [illegible] lifting up and [illegible] the [illegible] the [illegible]

PRESENT WORK.

During the last six years nearly 52 miles of modern sewers have been laid in place of old rubble or stone culverts. The work is still proceeding, and, [illegible] almost [illegible] have lately been discovered.

It might have been expected that as defective rubble sewers were replaced by self-cleansing sewers the cost of cleansing and flushing would diminish. To some extent this has been the case, but, as Mr. Hadfield points out, the present tendency is for the public to become more critical towards matters which a few years ago would have received little attention. "Consequently more and more attention [illegible] paid to Bye-laws, and, though at present the [illegible] is stationary, it can be taken that the work is being more thoroughly and systematically done."

During the year 1,346,[illegible] gallons of water were used for flushing purposes, representing approximately 8,311 flushes, an average of about 28 per day for 300 working days.

SICKNESS AND LOST TIME.

Some [illegible] appear under this heading. The average amount of time lost through bad weather during the twelve months was 1·3 hours per man per week, equal to the whole time of about thirty-three men, or 2·7 per cent of the whole of the employees. The average amount of time lost through sickness amounted to about three hours per man per week, 35 per cent more than in the preceding year. The average number of men absent through this cause was about seventy-three, or 6 per cent of the whole of the employees, permanent and casual. Through preventable causes the men have lost during the twelve months ·88 hours per man per week.

PRO PATRIA.

[TENTH LIST.]

We present herewith a tenth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Barker, Herbert M., articled to his father, Mr. Herbert W. Barker, surveyor to the Walmer Urban District Council, Royal Engineers (Territorials).

Bowen, E. J., clerk, Malvern Urban District Council, 8th Batt., Worcester Regiment.

Clowes, W. L., borough surveyor's office, Devonport (late of Stoke-on-Trent), Royal Army Medical Corps (Territorial); for the time stationed at the 4th Southern General Hospital, Plymouth.

Coombs, W. A., assistant chemist, gasworks, Malvern Urban District Council, Royal Army Medical Corps.

Fraser, Angus, assistant surveyor, Malvern Urban District Council, sergeant, 2nd S. Midland, R.F.A.

Jackson, J., clerk, borough engineer's department, Wrexham, North Wales "Pals" Battalion.

Layton, F., clerk, Malvern Urban District Council, bombardier, 2nd S. Midland, R.F.A.

Prydderch, R. J., assistant, borough engineer's department, Wrexham, North Wales "Pals" Battalion, Royal Welsh Fusiliers.

Richards, E. P., M.INST.C.E., M.R.SAN.I., F.G.S., formerly Government City Engineer of Madras, and chief engineer to the Trustees for the Improvement of Calcutta, Lieutenant, 7th (Service) Battalion Leicestershire Regiment, Badajoz Barracks, Aldershot.

Slack, N., clerk, Malvern Urban District Council, gunner, 2nd S. Midland, R.F.A.

Wade, Percy, deputy town clerk, Middleton, 2nd City Battalion ("Pals") Manchester Regiment.

Whitehead, H. M., [illegible] Carsock Rural District Council, Captain, 7th Batt., Notts and Derby Regiment, the Sherwood Foresters.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

436. Ventilation. What effect has (*a*) the breathing of animals and (*b*) the combustion of fuel upon the purity of the atmosphere? (T. R.)

437. Underpinning. A curved column in a church is showing signs of settlement. Describe, with sketches, the method of timbering and underpinning it. (L. C. B., *Cheadle*.)

438. Strength of Materials.—If a straight prismatic beam of timber floats in a horizontal position with a weight of 4 cwt. hanging to each end, what will be the bending moment at the centre of its length?

439. Stability of Wall.—How high may water rise on one side of a vertical wall, 9 ft. high 2½ in. thick, of material weighing 143 lb. per cubic foot, before the resultant force in the base of the wall passes outside the centre?

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

433. Mechanics.—Show how to find the periodic time of one complete vibration in a case of simple harmonic motion, and give a proof of the necessary formula.

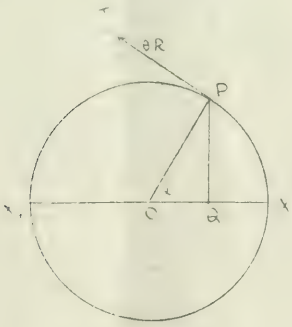
The periodic time of a complete vibration in a case of simple harmonic motion is given by the formula—

$$\text{Periodic time} = 2\pi\sqrt{\left(\frac{\text{displacement}}{\text{acceleration}}\right)}$$

The proof is as follows:—

Let the point P be describing a circle XPX, with a uniform angular velocity θ. Let XOX_1 be a fixed diameter, and let PQ be a perpendicular let fall from P to XOX_1 meeting the latter in Q. Draw OP, the radius of the circle XPX_1, and let it be called R. Let angle $POQ = \alpha$.

In the first place, we have to prove that the motion is simple harmonic. From the figure we have



The velocity and acceleration of Q = the parts of the velocity and acceleration of P resolved parallel to XOX_1; also, since P is describing a circle, acceleration of P = θ^2R along OP.

Acceleration of Q = $\theta^2 R \cos\alpha = \theta^2 OQ$.

This expression varies as OQ that is, as the distance of point Q from the fixed point O. The motion is therefore simple harmonic.

Now the velocity of Q = $\theta R \sin\alpha = \theta PQ$, and if OQ be made equal to a velocity of Q = $\theta\sqrt{(R^2 - \ldots^2)}$.

Thus, at X_1 and X the velocity of Q is zero, and at point O it is θR.

We see, therefore, that Q starts from rest at X_1, attains its greatest velocity at O, is once more in equilibrium at X_1, and returns to X in a similar manner. Now to find an expression for the periodic time, we have:

Time of Q from X to Q = time of P from X to P

$$\frac{\alpha}{\theta} = \frac{1}{\theta}\left(\cos^{-1}\frac{\ldots}{R}\right)$$

$$\text{and time from X to } X_1 = \frac{\pi}{\theta}$$

$$\therefore \text{ time from X to } X_1 \text{ and back to X} = \frac{2\pi}{\theta}$$

and this expression gives us the periodic time, and we have—

$$\text{Acceleration} = \theta^2 OQ = \theta^2 \times \text{displacement}.$$

$$\therefore \theta^2 = \frac{\text{acceleration}}{\text{displacement}}$$

$$\therefore \theta = \left(\frac{\text{displacement}}{\text{acceleration}}\right)^{\frac{1}{2}}$$

$$\therefore \text{Periodic time} = \frac{2\pi}{\theta} = 2\pi\sqrt{\left(\frac{\text{displacement}}{\text{acceleration}}\right)}$$

(B. K., *Hayes*.)

435. Damp Prevention.—Show by sketches three methods of preventing moisture in the soil from rising into a brick wall: (*a*) an ordinary 14-in. wall, (*b*) a 16-in. cavity wall, (*c*) an 18-in. basement wall.

The precautions which have to be taken to prevent moisture in the soil from rising into brick walls are, to a certain extent, governed by building by-laws. The following is an abbreviated extract: "Every new public or domestic building shall

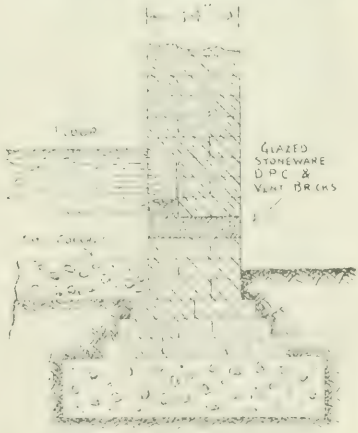


FIG. 1.

have in every wall a proper damp-proof course of sheet lead, asphalt, slates properly lapped and laid in cement, or other durable material impervious to moisture, beneath the level of the lowest floor timbers, and at least 6 in. above the ground adjoining." Fig. 1 shows the method adopted for ordinary walls. Glazed stoneware perforated bricks are shown, which act as a damp-proof course and as ventilators for the floor timbers. Fig. 2 shows the method for

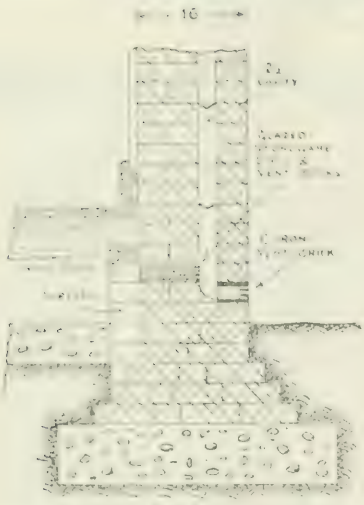


Fig. 2.

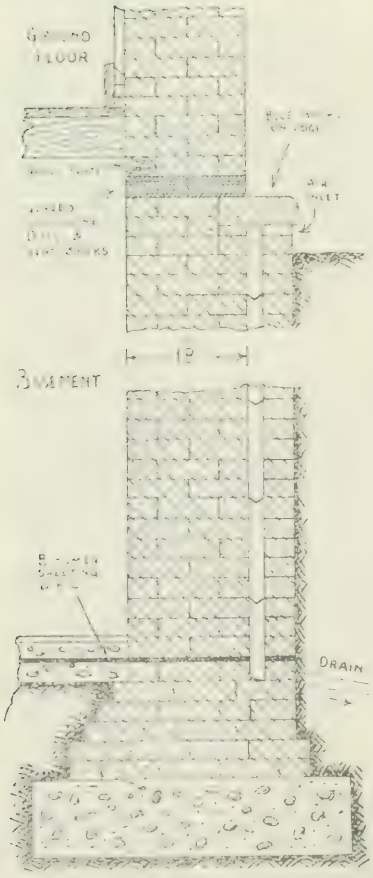


Fig. 3.

tied together at least every 18 in. vertically and 3 ft. horizontally. The site is also shown covered with [illegible] and filled with hygeian rock composition. The cavity must have an air inlet. Two damp-proof [illegible] (P. H. [illegible])

SOME NOTES ON ACHORUTES PURPURESCENS.

By G. Bertram Kershaw, M.A.M. [illegible]

Most [illegible] sewage works in contact with [illegible] appearing like sheets of black soot on the surface of any pools of sewage liquor, and on the filtering or contact material during the [illegible] of the year. At times the cast skins of these insects, together with the newly-moulted ones, appear like white bran on the surface of the filters.

Until comparatively recently this insect was regarded as *Podura aquatica*, but from recent work on the insect it appears that, although belonging to the family of *Poduridæ*, the vast majority of these [illegible] belong to *Achorutes purpurescens*.

I am indebted to my brother, Mr. J. C. Kershaw, F.Z.S., for the following notes on the insect:—

SUB-ORDER—COLLEMBOLA.

Fam. *Poduridæ*.

Gen. *Achorutes*.

Achorutes purpurescens (Lubbock).

Antennæ, 5-jointed, short; feet with two claws; two clawed hooks at extremity of abdomen; eyes not in a black patch; body covered with short, whitish hairs. Length given as [illegible] in. (Lubbock), but very variable. Saltatory appendage two-jointed agrees exactly with description. General colouring agrees with description given in monograph of the *Collembola* and *Thysanura* (Lubbock, p. 181. Pl. XVI., Ray Soc., 1873).

Mr. Kershaw also reports that of many hundred *Collembola* taken haphazard at the South Norwood sewage [illegible], over 95 per cent were *Achorutes purpurescens*.

It appears from his investigations that these insects will feed upon green algæ, humus from contact beds and percolating filters, also upon the sewage fungi, *Cladosporium fasciculatum* and *Sphærotilus natans*, while in captivity they will feed voraciously on damp blotting-paper, even when supplied with plenty of the above-mentioned foods. They were sometimes observed to eat the dead bodies of their own kind, so that they will in all probability eat any vegetable or animal matter, especially when decaying; the favourite natural food, however, appeared to consist of humus.

The food of these insects is of considerable importance in view of the clogging of filters by growths and organic matter, a point to which Mr. H. D. Bell drew attention at the Stratford-on-Avon sewage works some time ago.

It would be most interesting if experiments could be carried out with a view to ascertaining the actual weight of food-matter destroyed on the average by each insect, and, inferentially from this, the importance of numbers of these insects on contact beds and percolating filters from the practical point of view.

Such experiments would be most complicated, no doubt owing, among other things, to the question of variable moisture in the food supply, rendering delicate weighing operations very difficult.

Again, against food material devoured would have to be set matters excreted by the insects, so that the subject is a complex one.

The eggs are laid in random heaps in damp places on the filtering or contact material, also on the adjacent walls, at about the same level as the surface of the filtering material.

Several female insects sometimes lay in the same heap, and therefore the number of eggs in a batch varies from ten or twenty to several hundreds. They hatch in about ten days.

The Surveyor
And Municipal and County Engineer.

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BUILDING INDUSTRY AND THE WAR.

By E. C. P. Monson, F.R.I.B.A., F.S.I.*

Is it possible that we may have become too engrossed in our welfare as individuals, and that this war may provide an opportunity of getting, as it were, outside ourselves, and consequently obtaining a better perspective view of things as they really are, and of restoring that sense of their proper proportion as seen from a different and more independent standpoint?

The building industry, with which the architectural profession is so closely allied, is one of the first to feel the pinch. The state of the money market, the increase in prices, the difficulty of obtaining material, and many other questions arising, naturally affect the building owner, and through him the architect and the contractor, and it can only be by the most careful thought and nursing that contracts now running can be brought to a successful issue. Unfortunately the prices at which jobs have recently been tendered for have been so "cut" that any little unforeseen extra, to say nothing of large ones, which naturally makes the matter worse, must rapidly eat up the profits and tend to turn what might have been a margin on the right side into a bad loss. Any loss in this direction must naturally fall upon the builder and be a matter of most serious consideration to him, and often cause him some uneasiness. All this coming as it does so soon after the disastrous strike or lock-out in London, and the sectional strikes in many provincial centres, only emphasises the trouble and adds "insult to injury."

Personally, I have had no trouble with contracts which were in hand when the war started, and builders are doing their best to get on with them—and I do not anticipate any extras—but, I think it is only fair, if the job is genuinely proceeded with, that an extension of time should be allowed to the contractor, and that the penalty clauses should not be too strictly adhered to because of the great difficulty which is being experienced in obtaining some kinds of materials.

In the case of one large contract for which the tender was accepted before the war, but which the contractor would not proceed with owing to the causes mentioned above, the matter was settled and the contract signed upon my clients agreeing to pay an additional sum to cover the extra cost of material [illegible] the tender. Such extra sum in total is not to exceed 5 per cent of the total cost of the job, and is to be the subject-matter of a separate certificate at the completion of the contract, upon ocular proof being demonstrated to me that the extra prices have been actually disbursed.

In small jobs I have not found that prices have been so materially affected as to make the carrying out of the work impossible or unremunerative. In many cases, I am only too sorry to say (for unfortunately I sometimes have been guilty of it myself), when making out the preliminary estimates of the cost of the works to submit to one's client, sufficient notice has not been taken of the increasing stringency of Building Acts and by-laws, and of the enormous advances in the price of labour and the cost of material, which, taken with the rise of insurance premiums for employers' liability, unemployment, health, and such like burdens, all, however, very useful and necessary in their way, have in the last twenty years or so, in my opinion, raised the price of building work some 40 per cent, and even in the last few years by as much as 15 per cent to 20 per cent. Consequently the client has been given a false impression of what he would be called upon to pay, and been dissatisfied when the tenders arrived.

TIMBER SUPPLIES.

I think in a few months' time when timber ports are fully open again, and either the old or new markets are available for the purchase of materials which have inordinately increased in price, that no difficulty will be experienced in building works, for already the cost of some materials which rapidly went up has dropped considerably.

Should, however, such optimism not be realised, then it will surely be time for H.M. Government to step in and fix a minimum price for the respective materials (as has been done with success in the case of food), so as to prevent grasping merchants and importers from making an inordinate profit and crippling the industry of the country, thereby causing serious unemployment to the detriment of the community at large.

HOUSING SCHEMES.

What is our good friend the Chancellor of the Exchequer, the Right Hon. D. Lloyd George doing? He very generously promised a sum of £4,000,000 to be spent at once in housing schemes. This could now be readily applied and would be an enormous help, not only to the architects, who, by the bye, would only receive a very small part of it, but also to the workers in the building and allied trades. Moreover, it would supply that much needed provision of housing which is so abundantly required, and which is so anxiously being begged for in all parts of the land.

I recently saw a notice that housing schemes were to be sparingly prepared, but I cannot think that the promised sum has yet been earmarked or spent, and to my mind the sooner a start is made with it the better. Unfortunately the rate of interest charged by the Public Works Loan Commissioners has been raised from 3½ per cent to 4 per cent, which, of course, will make a lot of difference in the preparation of housing schemes, and I am afraid in some cases will cause the houses either to be let at rents greater than the people can afford to pay so as to show an adequate return in the nett outlay, or else the places must be let at an uneconomic rent and then the ratepayers at large must make up the deficiency, which is not a proper course to pursue. I sincerely hope it will be possible to keep the rate of interest down so as to enable the housing schemes to be proceeded with.

One result of the war will, I think, be the impressing upon all concerned the necessity of the most rigid economy and reorganisation of methods of building, as well as the standardisation of materials used, though not necessarily so as to make every street of houses appear as if they have been built from a box of bricks, or even cast in the same mould. This monotonous effect when it is resorted to is always sure to be depressing and to give dissatisfaction, and what an architect has to aim at is greater elasticity and freedom in his design, but not necessarily a searching after exaggerated effect which unfortunately very often produces monstrosities. It must be remembered that by pleasing the eye in the matter of building one undoubtedly improves the mind.

* Extracts from Presidential Address delivered before the Society of Architects last month.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

[illegible] Council of the Institution held on Saturday, [illegible] Mr. T. S. Parsons (President) [illegible] W. N. Blair, H. P. Brown, T. S. [illegible] Hoopes, F. W. A. Hoyland, W. A. L. [illegible] E. B. Macey, W. H. Prescott, N. Scott, W. Scott, E. J. Tipper, H. P. Wakeham, C. E. Wells, O. F. Wilson and the secretary. Apologies for absence were received from Messrs. J. A. Brown, F. W. [illegible], R. H. Dennis, F. Mason and H. E. Stilgoe.

THE MEMBERSHIP.

The following candidates were elected:

Associate: Messrs. J. A. Brown, [illegible] surveyor, [illegible] J. Dorman, [illegible] Urban District Council, F. L. [illegible] surveyor to the Whitstable Urban District Council; and R. Millar, burgh surveyor, Greenock.

Associate (by transfer): Messrs. G. W. Lawson, [illegible] St. Asaph Urban District Council; F. E. Williams, [illegible] borough surveyor, [illegible] and E. L. Dapper, [illegible] assistant to engineer and surveyor, Llantrisant Rural District Council.

Student: Mr. G. Stevens, [illegible] to Dorking Rural District Council.

Honorary Associate (by transfer): Member: Mr. H. Wood, deputy city engineer, Norwich.

DEATH OF MR. W. B. BRYAN.

It was resolved to send a letter of condolence to the relatives of the late Mr. W. B. Bryan.

UNIFORMITY OF TENDER FOR SANITARY PIPES.

It was resolved that a deputation from the Builders' Merchants' Alliance be received, and that the secretary be authorised to arrange a date and time.

INSTITUTION MEETINGS.

It was resolved that the president be asked to arrange a meeting at which a paper by Mr. Scott Wood on "Building By-laws" might be read.

HONORARY MEMBER.

It was resolved that Sir A. R. Binnie be asked to allow his name to be placed on the roll of honorary members of the institution.

PREMIUM SCHEME, 1914-15.

In view of the large number of the junior members on active service, it was resolved that the premium scheme for 1914-15 be as follows: Three prizes of £5 5s., £4 4s. and £3 3s. respectively for the three best original papers read at a meeting in connection with the institution, or published in the *Journal*, the council reserving the right to withhold all or any one of the prizes in the event of no paper of sufficient merit being presented.

VACANT APPOINTMENTS.

The secretary was authorised to make arrangements [illegible] the information as to vacant appointments.

NEW ZEALAND EXAMINATION.

It was resolved that an examination be held in New Zealand provided at least four candidates present themselves, and that suitable arrangements can be made.

ADDITION TO BOARD OF EXAMINERS.

It was resolved that Mr. J. Walker Smith be added to the Board of Examiners.

CHAS. JONES MEMORIAL.

The reply from the relatives of the late Mr. Chas. Jones was received, and it was resolved that a Charles Jones Memorial Prize be established, and that it be referred to the Finance Committee to consider as to the method of the utilisation of the fund for this purpose.

Institution of Water Engineers.—The annual winter meeting of the institution will be held on Friday and Saturday, December 11th and 12th. Members and others interested are requested to reserve these dates and do their best to secure a good attendance.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it a matter of surprise that our law courts [illegible] the judges sit in courts which would make excellent [illegible] and that the refreshment rooms are in the crypt? How many of the older public buildings in London were designed to suit the purposes for which they were intended?

* * * *

Is it not to be hoped that the colossal new buildings for the Housing of the London County Council will be found exactly suitable for the purposes they are designed to meet, and how long ago is it now since they were designed? Which is going to last longest, the [illegible] of this building?

* * * *

[illegible] London [illegible] spended [illegible] the battle of the celebrated London Scottish Regiment? What does the Kaiser now think of our small "Citizen Army"?

* * * *

Are not the members of the "Professional Classes War Relief Council" worthy of the support of those who hold permanent appointments which are not affected by the war? Should their more fortunate brethren not try and assist those professional men who, from no act of their own, are beginning to feel the stress of "hard times"?

* * * *

Was not the applause which followed the president's announcement at the first meeting of the Institution of Civil Engineers the other night, that the name of his Imperial Majesty the German Emperor had been struck off the list of honorary members very significant? Are there not still left some German members of the institution whose names might equally well be removed?

* * * *

Was it not [illegible] from the presidential address that whereas fifty years ago the railway companies were carrying their passengers at the rate of one passenger per half a ton of dead load, it now requires 3 tons of dead load per passenger? Do we realise that the present comfortable manner in which we travel is very costly to the railway companies, and that they have managed so well that railway fares are much less than formerly?

* * * *

Would it not be possible to draw the attention of the War Office or other authorities to the value of Mr. Hartley's articles on camp sanitation and similar matters now appearing in THE SURVEYOR? Would not these, if circulated among certain units [illegible] great benefit to the officers and men?

* * * *

What steps, if any, will the council of the Institution of Municipal and County Engineers take with reference to the report on the "Practical Training of Engineers" recently issued by the Institution of Civil Engineers? Will they endorse it without any suggested alterations or amendments, or will they consider that it thoroughly meets the case? Will not the members expect some pronouncement from the council on this important question?

* * * *

Does it not speak well for the British people that, notwithstanding the gigantic war in which we are engaged, their daily avocations appear to go on much as usual? Does not the action of the various municipal authorities in proceeding with works and official duties set an excellent example to the community?

City of London Sanitary Company: Donations to Library.—Staff Sergeant Drayton, on behalf of the men of the 1st City of London Sanitary Company, R.A.M.C. (T.F.), begs to thank the following publishers for the very generous donations of technical books which they have made to the company's library: Messrs. J. & A. Churchill; Crosby Lockwood & Son; Longmans, Green & Co.; E. & F. N. Spon, Limited; B. T. Batsford Limited; Gale & Polden; St. Bride's Press, Limited.

Law Notes.

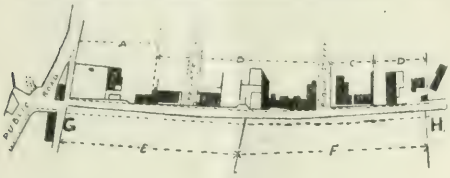
EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address. But correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction *i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

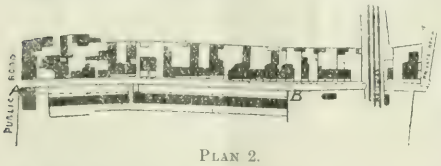
In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

WIDENING STREETS. "H. H." writes: Have a borough corporation a legal right to make two existing roads which are 18 ft. and 16 ft. wide respectively into 36-ft. streets to comply with the by-laws, as shown on the drawings forwarded herewith. Plan No. 1. The existing roadway from G to H was originally a road to the land, and averages about 18 ft. wide. The corporation have from time to time allowed buildings to be erected adjoining this roadway as shown. The corporation now wish to make



PLAN 1.

this street 36 ft. wide in compliance with the by-laws. Owners of the land E and F agree to give up the land to make this street 36 ft. wide, and pay half the cost of street charges, according to frontage. Owners B and D also agree to pay half the cost of street charges. Owners A and C object, and state they are only entitled to pay for one-half of the existing roadway, which is only 18 ft. wide. Have the corporation any power to make owners A and C pay for half the cost of a 36-ft. street if the corporation carry out the work? Plan No. 2. This is a similar case to the previous one, with the exception that both sides of the road are built upon. The property on one side belongs to one owner, and the widening to make a 36-ft. street can only be taken



PLAN 2.

off this side (A to B). The owners are prepared to sell the land and cottage at the top of the road, but the numerous owners on the other side of the road state that they are not prepared to pay more than for half cost of the existing road, which is about 16 ft. wide. In this case would the corporation have power to purchase the land and apportion the cost with the street charges, according to frontage. I forward copy of the by-laws of the corporation. The corporation have made application to the Local Government Board to adopt the Public Health Amendment Act, 1907. I also forward a copy of a clause in the Corporation Private Act of 1914, which, I think, bears on the points in question.

[CLAUSE IN CORPORATION ACT, 1914, ABOVE REFERRED TO.]

54. (1) When a road or lane within the borough is about to become a new street within the meaning of the Public Health Act 1875 but the land on only one side of such street has been or is about to be built upon the corporation may instead of requiring the owner of the land built on or in course of being built on, to widen such road or lane to a width prescribed by the by-laws in force in the borough [illegible] such road or lane so as to give a width of not less than one-half of such prescribed width from the old centre line of such road or lane to the boundary thereof adjoining such land. (2) Provided that if and when the land on the opposite side of such road or lane shall be in course of being built on or prior to the corporation approving plans for the erection of buildings upon the land on such opposite side the owner of such land shall subject as aforesaid complete the widening of such road or lane so as to give the complete width prescribed as above said.

Plan No. 1. Assuming that the existing road is not repairable by the inhabitants at large, the council can, in my opinion, make up the whole road when it has been widened by the inclusion of the land to be given up by E and F, and apportion the cost among all the frontagers according to their frontage. Plan No. 2. In my opinion the cost of making up the whole street, when widened, can be apportioned among the frontagers in this case also, assuming, as before, that the existing road is not repairable by the inhabitants at large. The purchase of the land and cottage can be effected by the corporation under sec. 154 of the Public Health Act, 1875, but the cost cannot be charged to the frontagers.

CONTRACT. ARBITRATION CLAUSE. "Resident Engineer" writes: A contractor has carried out certain works for a council under contract, one of the clauses of the general conditions being: "Should any difference or dispute arise between the clerk of works and the contractor relating to any matter in the execution of the works, such difference or dispute shall be referred to the engineer, and his decision shall be final and binding on all parties." And in another clause it states that, should any dispute arise, the engineer shall be the arbitrator to settle such dispute. The matter is now in dispute over several points, and the engineer proposes to act as arbitrator. Is the contractor correct in saying that, at the present time, according to the recent decision of the courts, the engineer, being an interested party, cannot act as the arbitrator? Kindly state the names of the various cases bearing upon this subject, and where and from whom can the querist obtain a full report of such case or cases giving the last judgment on the matter.

The contractor's statement that "the engineer cannot act as arbitrator" is too wide, and is probably based on a misapprehension of the effect of the decision in the case of *Freeman & Sons v. Chester Rural District Council* (Law Reports, 1911; 1 King's Bench, p. 783). In that case a firm of contractors brought an action against the council for money alleged to be due under a contract for works. The contract contained a clause making the council's engineer arbitrator, and the council applied to the Court to stay the action on that ground (so that the engineer might decide the matter as arbitrator). The contractors challenged the engineer's conduct, and the Court, not being satisfied that there was no sufficient reason why the matter should not be referred—*i.e.*, decided by the engineer—refused to stay the action. The ground of the decision was that, as the engineer's conduct had been challenged, the matter could not be properly dealt with without his cross-examination, and that it was obviously impossible to allow him to be cross-examined by one of the parties to the arbitration while he was sitting as arbitrator between them. The Court thus refused (on the facts of this particular case) to exercise the discretion given to them by sec. 4 of the Arbitration Act, 1889, to stay the action. But it by no means follows that they would do so in every case in which the engineer of one of the parties to a contract has been appointed arbitrator. Each case would be decided on its own merits.

RAILWAY EMBANKMENT: CULVERT: FLOODING. "Equitas" writes: A certain area is drained into open dykes controlled by Drainage Commissioners. A railway company constructed, some years ago, an embankment crossing one of the main dykes, the drain being carried through the embankment by means of a culvert. It can be proved that the level of this culvert is too high, thereby holding back the drainage and causing waterlogging of the land above. On complaint being made to the railway company, their reply is that the culvert was constructed by them to the approval of the engineers to the Drainage Commissioners. The landowners want to compel the rail-

[illegible]

obliged.

[illegible]

pel the owners to connect to the sewers, although the cesspools may be in good order? (2) Also in a case where house drains are connected to an old sewer (which is to be abandoned) in certain back gardens, can the council compel the owners to disconnect and reconnect to the new sewer in the road—which will [illegible] cil carry out the work at the ratepayers' expense?

[illegible] the new sewers if their drains are sufficient for effectual [illegible] ual drainage, the council cannot compel the owners to [illegible] them-selves close the old sewer, and provide drains con- [illegible] incurred in the execution of the Public Health Act, 1875. See sec. 24 of that Act.

[illegible] form me where I could obtain printed forms as used by owners of building estates when letting off plots to lessees? I understand it is customary to adopt a common agreement and covenant throughout.

I do not know where such forms can be obtained. Conditions differ on different estates, and the usual practice is to have form of agreement drafted and settled by the owner's [illegible]

ADMINISTRATIVE MUNICIPAL WORK AT CLACTON-ON-SEA.

Clacton Urban District Council have had placed before them the final accounts of the construction of [illegible] beginning of the season in May. The scheme was prepared by the council's surveyor, Mr. D. J. Bowe, and tenders for the work were invited in October, 1913. When received, these varied from £14,975 to £19,750, and the surveyor reported that in his opinion they were so high that he could not recommend the council to accept one of them. He subsequently informed the council that he could carry out the whole of the work specified and in the quantities for £11,500, and this, it has now been reported, he was successful in doing, the cost of the work coming out at £11,426. The cost of lighting the pavilion, as well as other work on the greensward—in the way of promenades, flower beds and terraces, costs of loan and other incidental expenses—bring up the total expenditure to £13,000. For this amount the council have received a band pavilion the value of which as tendered for in the open market is nearly £17,000, thus giving ample proof that the decision of the council in asking the surveyor to carry out his scheme by administration was a wise one, not only in the interests of the ratepayers financially, but also from a constructional point of view, the whole of the work being particularly well executed throughout.

The building, which is in the form of an amphitheatre in early Italian Renaissance, has seating accommodation for 4,000 persons, one-half being under cover in inclement weather, and it has, needless to say, formed one of the chief attractions of Clacton's many visitors during the summer.

The congratulations of the Building Committee and council were heartily expressed to Mr. Bowe on the [illegible] work, and to [illegible] generally.

London Electricity Supply.—At their meeting on Tuesday the London County Council agreed to proceed to Parliament with the scheme for dealing with electricity in Greater London by means of a system of municipal control with company management.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bexhill T.C. (November 5th. Mr. R. G. [illegible] £171 [illegible] and improvement of Station-road, and £300 for works of storm-water drainage at Cooden Beach.—The town clerk, Mr. T. E. Rogers, stated that the landowners had agreed to contribute, and the railway company had concurred with the arrangements. No opposition was offered to the proposed loan for storm-water drainage.

Bridgwater R.D.C. (November 6th. Mr. H. S. Stewart).—£1,000 for the purchase of land and the erection of working-class dwellings at Huntspill.—The council, it was stated, were satisfied there was a demand for houses in the district, and it was proposed to erect four dwellings. The rental of the houses would be 4s. 6d. per week. Evidence was given by the surveyor, Mr. W. A. Collins, with respect to the [illegible]

Bridlington T.C. (November 5th. Major C. E. Norton).—This was an inquiry into the application for a Provisional Order to enable the corporation to acquire and carry on the new spa and gardens, which for nearly twenty years have been in active competition with the Royal Prince's Parade, the property of the municipality. The promenade and concert hall were opened in 1896. Proposals were ripened for improving the resort, but there was a lack of capital, and eventually negotiations were opened with the corporation, who agreed to purchase the undertaking for £16,000. The borough engineer, Mr. Harry W. Smith, said he considered it of importance that the whole of the foreshore (for the purchase of which it is proposed to pay £500) should be in the hands of the town. The present condition of the cliff was not a credit to Bridlington. A well-ordered municipal scheme of treating the foreshore would be much better than a miscellaneous collection of buildings under private ownership. With respect to the purchase of the whole property, he considered £16,000 a reasonable price.

Chorley T.C. (October 28th. Mr. M. K. North).—£4,700 for the reconstruction with granite setts of a portion of Preston, Chorley, and Bolton main road within the borough, and £3,963 for works of private street improvement.—The borough surveyor, Mr. G. H. Hopkinson, in reply to the inspector, said the cost of the upkeep of the main roads in the borough in 1894 was £909. In the present year it was £2,700. In respect to the proposed loan for private improvements, the town clerk said the money was needed for the making up of one street, parts of six streets, and ten back passages.

East Preston R.D.C. (November 4th. Mr. R. G. Hetherington).—£1,000 for sea defence works fronting Rustington sea road.—The surveyor, Mr. W. L. Lency, gave details of the scheme, and explained that it was not one of coast defenece, but for the defence of the road. The sea wall would be a retaining wall for the road.

Holywell R.D.C. (November 3rd. Mr. W. H. Collin).—£13,500 for building working-class dwellings at Mostyn and Bagillt.—It was stated that at Mostyn a site of 3½ acres had been acquired for the sum of £120. On this it was proposed to build twenty-two houses, which would be let at a rental of 4s. 3d. a week, the tenants paying rates. At Bagillt it was stated the intention was to build thirty houses on land which was to be purchased for £635, the extent of the land being 11½ acres.

Llangefni U.D.C. (November 4th. Mr. A. W. Brightmore).—£4,250 for the purchase of the town hall, market halls, and market place.—It was explained that the council's reason for acquiring the property was that they wished to secure the control of the market, which was the main asset of the town, and one of the largest, if not the largest in North Wales.

Pwllheli T.C. (November 5th. Mr. A. W. Brightmore).—£4,000 for the construction of a sea wall parade and road to connect the south beach and west end.—The town clerk, Mr. E. R. Davies, in explaining the scheme, said the development of the town as a seaside resort had been considerably retarded by reason of the two parades being separated for a length of 427 yds. If the repayment of the

[illegible] £220.

Sheringham U.D.C. (October 27th. Mr. R. H. [illegible] £900 for [illegible] It appeared from a [illegible] Mr. F. Hall-Smith, that the [illegible] and promenade. This sewer is sufficient for ordinary rainfall, but in case of heavy storms the [illegible] overflows.

Swindon T.C. ([illegible] 28th. Mr. P. M. Crosthwaite).—£33,000 for the extension of the Rodbourne [illegible] Conservation [illegible] soon as possible, and it was explained that, as at the present time the Public Works Loan Board would not lend money excepting for the purpose of finding work for the unemployed, the corporation would have [illegible] wanted.

APPLICATIONS FOR LOANS.

Barnet U.D.C.—£6,750 for additional workmen's dwellings.

Dartford U.D.C.—£8,930 for the provision of workmen's dwellings, and £1,000 for street widening.

Deptford B.C.—£2,413 for washing baths.

Horbury U.D.C.—£2,[illegible] for works of sewerage.

Llandudno U.D.C.—£1,500 for water mains.

Margam U.D.C.—£9,703 for a housing scheme.

St. Anne's-on-Sea U.D.C.—£15,038 for building a public hall.

Whitby U.D.C.—£15,471 for the purchase of the saloon grounds and for roadmaking.

LOANS SANCTIONED.

Birstall U.D.C.—£420 for works of sewerage.

Bowland R.D.C.—£2,080 in connection with the sewage disposal works.

Burry Port U.D.C.—£900 for the provision of a public slaughterhouse.

Chailey R.D.C.—£1,300 for a sewerage scheme for Cooksbridge and Hamsey.

Crompton U.D.C.—£276 for the provision of a sewer in connection with the refuse destructor.

Darlaston U.D.C.—£1,760 for street improvement.

Godstone R.D.C.—£560 for drainage works at Lingfield.

Maidstone T.C.—£600 for the purchase of a site for workmen's dwellings.

Tilbury U.D.C.—£36,220 for the provision of workmen's dwellings.

Withernsea U.D.C.—£400 for works of sewerage, subject to the main being laid in and covered with concrete, and £1,420 for the New North-road (provisionally).

FORTHCOMING INQUIRIES.

NOVEMBER.

	£
16.—**Aylesbury.** For cemetery extension (Mr. F. H. Tulley)	2,070
16.—**Broadstairs.** For the provision of a depot (Mr. R. H. Bicknell)	2,050
16.—**Ludlow.** For the provision of [illegible] (Mr. H. S. Stewart)	4,000
16.—**Margate.** For works of street improvement (Mr. R. H. Bicknell)	1,988
17.—**Maldon.** For works of sewerage (Mr. A. W. Brightmore)	320
17.—**Newquay.** For the provision of a depot and stables (Mr. W. O. E. Meade-King)	1,200
17.—**Rawtenstall.** For the purposes of electricity (Mr. W. M. Cross)	[illegible],500
17.—**Sunderland.** For the provision of a cemetery (Mr. P. M. Crosthwaite)	21,270
17.—**Totnes.** For works of sewerage (Mr. R. G. Hetherington)	570
18.—**Knaresborough.** For the provision of a recreation ground and works of sewerage (Mr. P. M. Crosthwaite)	1,065
18.—**Nantwich.** For works of water supply (Major J. Stewart)	710
18.—**Newmarket.** For [illegible] water supply (Mr. A. W. Brightmore)	500
18.—**Paignton.** For works of sewerage (Mr. H. G. Hetherington)	975
18.—**Prestwich.** For [illegible] (Mr. W. M. [illegible])	20,515
18.—**St. Dennis.** For the provision of a burial ground (Mr. W. O. E. Meade-King)	1,000
18.—**Warrington.** For park extension (Mr. Edgar Dudley)	4,192
18.—**Yeovil.** For the provision of houses (Mr. H. S. Stewart)	890
19.—**Aylesbury.** For the provision of houses (Mr. H. S. Stewart)	8,600
19.—**Barnoldswick.** For the purposes of the gasworks (Mr. P. M. Crosthwaite) ...	1,500
19.—**Buckfastleigh.** For works of water supply and street improvement (Mr. W. O. E. Meade-King)	345
19.—**Coventry.** For works of street improvement (Mr. Edgar Dudley)	1,949
20.—**Mirfield.** For [illegible] and [illegible] purposes (Major J. Stewart)	3,254
[illegible]—**Rugby.** For the purpose of playing fields [illegible] and dwellings (Mr. E. Dudley)	6,300
2[illegible]—**Manchester.** For the provision of a [illegible] (Major J. Stewart)	2,927
20.—**Tiverton.** For the provision of conveniences and water supply (Mr. W. O. E. Meade-King)	225
25.—**Glamorgan.** For the provision of a hospital (Dr. W. W. E. [illegible])	14,000

Live-saving Collars.—We are informed that every officer and man on the Fleet will be supplied [illegible] life-saving appliance in the form of a collar which he will carry about with him at all times. The model chosen by the Admiralty is one that folds up into a very small compass. It could easily be carried in the waistcoat pocket, and when necessary might be inflated in a moment. The contractors are delivering these collars with the utmost rapidity. Dexine, Limited, Abbey-lane, Stratford, have received an order for some thousands, and have already delivered large quantities. Although so small, this collar, when inflated, affords a great deal of assistance to a man in the water, and will sustain him as effectively as does a cork lifebelt. Its size is 11 in. in diameter, and it is fitted with a tube and screw valve. The weight is about 4 oz., and it is folded and enclosed in a little case of stockinette material that fastens with a clip.

Costly Roads: Rural Councillors' Suggestions.—At the last meeting of the Midhurst, Sussex, Rural District Council, an informal discussion took place on the question of the cost of the upkeep of the roads. The chairman of the Roads Committee, Mr. Fraser Piggott, said the great question appeared to him to be what material was to be used. The committee's feeling was that under the present traffic it was no use putting on anything but the strongest material. Granite was the cheapest in the end, because it lasted longer than flints. Some of their roads were just as much used as the county roads, and they had a great deal more mileage than they ought to. The Rev. J. A. S. Paget Moffatt said a great expenditure upon roads had arisen since the introduction of the motor. By tarring they had to make a beautiful surface for luxurious motorists. He suggested motors should be abolished, and they should return to the "good old-fashioned horse"—(laughter). To Mr. Aman the idea was uppermost that the "outsider" who used the roads should be made to pay, and as one way of making them he considered it would be a good thing if the old turnpike gates were re-introduced. Mr. J. Mitchell considered the roads were [illegible] well. They were [illegible] than roads in other districts, and he suggested lowering their expenditure on them. The better they kept the roads the more traffic they got on them. His views were supported by Mr. G. Knight, who said they could not afford to make themselves a pattern for the rest.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Bournemouth—Derby, Doncaster, Kendal, Lindsey, Newport, Northumberland, Penzance, Southampton, Southwark, Wednesbury, York; and new plant, etc.—Margam, Market Bosworth, road and material—Barnoldswick, Exmouth, Hull, Lambeth, Southampton, sewerage and sewage disposal—Worcester, water, gas and electricity—Fifeshire, Longtown.—Particulars of other works projected will be found in our Local Government Board Inquiries pages.

BUILDINGS.

Bournemouth T.C.—The council have agreed to the proposal of the borough surveyor, Mr. F. W. Lacey, to continue the protective works along the cliffs, a distance of about 500 ft. from the Boscombe Pier approach. Steps are also to be taken for the security of the cliffs in the neighbourhood of the Toft steps, although, it is explained, this would be to some extent in the nature of an experiment, as it was impossible to say whether they would effect a permanent cure.

Derby T.C.—It has been decided to build a tramway shelter at Alvaston, at an estimated cost of £373.

Doncaster T.C.—A scheme is to be promoted for the provision of wash-houses and public baths, including Turkish baths.

Kendal T.C.—It is proposed to carry out structural alterations at the public abattoir, at an estimated cost of £500.

Lindsey C.C.—Plans have been passed for an extension of the Bracebridge Asylum, at an estimated cost of £20,000.

Llantarnam U.D.C.—Tenders are being invited for the erection of a new fire station.

Newport (Mon.) T.C.—It is proposed to erect a bridge across the river at an estimated cost of £78,697. It will be of ferro-concrete, 24 ft. wide, and will be placed alongside the existing bridge to form part of a permanent bridge, which, when completed, will provide a structure 75 ft. wide. In the above estimates the cost of acquiring land and the construction of tramways is not included. The borough engineer, Mr. H. Tremelling, has received instructions to confer with the engineer, Mr. De Vesian, on the subject.

Northumberland C.C.—Plans for a proposed consumptive sanatorium at Woodley are in the hands of the Local Government Board awaiting final approval. The proposal is to accommodate 144 patients, at a cost of £30,000. It is not proposed to proceed with the building at present, but only to put down the foundations and do certain other work.

Penzance T.C.—It has been decided to strengthen the western quay abutting on the dock, and provide store buildings, at an estimated cost of £2,000.

Southampton T.C.—The tender of Mr. I. Nichol, at £3,137, has been accepted for the building of the Portswood branch library.

Southwark B.C.—It has been agreed to erect a coroner's court and mortuary in St. George's churchyard, subject to the Local Government Board sanctioning a loan of £4,800 to meet the cost.

Wednesbury T.C.—The council have under consideration a communication from the Staffordshire County Council, suggesting the formation of a joint isolation hospital area, comprising the authorities of Wednesbury, Willenhall, Darlaston, Heath Town, Wednesfield and Short Heath.

York T.C.—The Health Committee have submitted a recommendation for the purchase of property near Cottingham, for the purpose of a sanatorium.

HOUSING AND TOWN PLANNING.

Margam U.D.C.—The council have approved the scheme of the surveyor, Mr. John Cox, for the erection of forty-seven semi-detached houses at Bryn, at an estimated cost of £9,703.

Market Bosworth R.D.C.—The council have approved a scheme for building workmen's dwellings at Desford, at an estimated cost of £4,630.

Walsall T.C.—It was stated on Monday by the chairman of the Health Committee that action they had taken in the last four years had resulted in 3,000 houses being repaired and 337 closed, of which 286 had been demolished. Upwards of 2,500 houses had been minutely examined under the provisions of the Housing and Town Planning Act.

Worthing T.C.—A statement prepared by the borough surveyor, Mr. F. Roberts, has been submitted, showing the estimated annual expenditure and receipts in respect of a scheme for the erection of sixteen cottages. A sketch plan of the buildings accompanies this statement. The Sanitary Committee have been asked to bring up a scheme for consideration by the council.

PARKS AND OPEN SPACES.

Southgate U.D.C.—An expenditure of £1,750 has been agreed to upon draining, levelling and turfing the cricket field, and forming a bowling green and tennis courts.

ROADS AND MATERIALS.

Barnoldswick U.D.C.—The plans of the surveyor, Mr. W. Ellis, for a new road from Barnoldswick to Stone Trough, have been forwarded to the other local authorities concerned. The scheme is estimated to cost £21,500.

Bradford (Wilts) U.D.C.—The surveyor, Mr. R. B. Lees, reported that he had been to London to see a road dressing which it was claimed did not make the surface of the road slippery, and from what he saw he thought the claim was justified. It did not form a smooth surface on the road like tar, but seemed to penetrate more into the road. It was called "Bracol," and described as a liquid rubber asphalt. He suggested using it in the centre of the town next season, and also in Silver-street, where tar could not be used. The council sanctioned this being done as an experiment.

Bristol T.C.—It has been agreed by the Sanitary Committee to purchase land valued at £550 for the widening of Filton-road. The Road Board have sanctioned a grant of £800 towards the cost of the work, which is approximately £3,500. Property in Rupert-street and St. John's Bridge is to be purchased at a cost of £1,900 for the improvement of Rupert-street.

Buxton R.D.C.—The question of the construction of a new road at Bugsworth is to be the consideration of the council.

Cambridgeshire C.C.—The Finance Committee are considering a supplementary estimate of £1,070 for making up part of Fulbourne-road.

Darlington R.D.C.—Owing to complaints of the slippery state of the tarred roads the council have adopted a resolution urging the county council to leave strips of 4 or 5 ft. at the side of the roads, with ordinary macadam wherever practicable.

Exmouth U.D.C.—A scheme has been adopted for the construction of the second section of the Marine Drive, at an estimated cost of £5,000.

Fulham B.C.—The council have agreed with the London County Council to contribute one-third of the cost of widening part of Fulham-road.

Hull T.C.—An extensive scheme of street improvement has been adopted, including a proposal for building 250 workmen's dwellings.

Ilford U.D.C.—Authority is being sought for an expenditure of £36,250 for the improvement of main roads and tramway margins.

Lambeth B.C.—The council last week agreed to take up a loan of £15,000 for paving works.

Middlesex C.C.—A grant of £2,574 has been sanctioned towards the cost of wood paving part of Edgware-road.

Rutland C.C.—The Main Roads Committee reported recently that they had received complaints as to the unsatisfactory condition for horse traffic of the sides of certain roads coated with tar or other similar material, and they were proposing to make arrangements to obviate the inconvenience caused by levelling, as far as possible, the sides of such roads.

Southampton T.C.—The borough engineer, Mr. J. A. Crowther, reported that he had had an interview with the Road Board at which he made suggestions for road strengthening work within the borough at a cost of £12,885 5s. It was probable that the Road Board would make a grant of a third of the amount, £4,295. Another piece of work suggested was an improvement at Hill Lane, near Fourposts Hill, involving the purchase of about 350 sq. yds. of land at an estimated cost of £85. Of this sum the Road Board had promised one-third, and negotiations are to be entered upon for the purchase of the land.

Stockton T.C.—With the object of providing work the corporation have adopted a scheme of making a new road to improve the connection between the Oxbridge and Hartburn districts at a cost of £1,500, while another road-making scheme is under consideration.

Sunbury U.D.C.—Messrs. Langley & Johnson, of Slough, having intimated their inability to proceed with the contract for road widenings at Charlton, which the council are undertaking on behalf of the Metropolitan Water Board, new tenders were invited, and Messrs. Langley & Johnson presented an amended tender for £12,654, an increase of £565, and this has been accepted. The next lowest was sent in by the Road Maintenance Company, who quoted £12,749, a £960 more than their first tender.

Surrey C.C.—It was reported on Tuesday that the Road Board had agreed to subscribe £1,100 towards the cost of the bridge at Pain's Hill, Cobham.—Grants were also made towards a number of improvements on main and assisted roads in the county. In the case of main roads the grant was one-third, and for assisted roads one-fourth of the cost.

Wadebridge U.D.C.—The council have approved plans for the proposed new road from Wadebridge to Ruthern. The length of the new road will be about 3 miles, and it will link up important main roads.

Westhampnett R.D.C.—It has been agreed to make an application to the Road Board for a grant to enable the council to carry out the surface-tarring of the Chichester-Bognor road in accordance with an amended estimate of the county surveyor. The council have also approved estimates for the use of 6,352 gallons of tar in the lower district and 4,990 gallons in the upper district during the season 1915, and tenders have been invited for the supply of 11,300 gallons.

SEWERAGE AND SEWAGE DISPOSAL.

Chailey R.D.C.—Specifications and quantities are to be prepared for a sewerage scheme for Cooksbridge and Hamsey.

Cheshunt U.D.C.—By the sale of the sewage farm crops and sundries the council realised £243, against £210 last year, and this although mangolds were lower in price than last year.

Cork R.D.C.—It is proposed to carry out a scheme of drainage for South Douglas-road and district, at an estimated cost of £1,200.

Foleshill R.D.C.—On behalf of the parish of Bedworth, the rural council have entered into an agreement for the purchase of a piece of land for extending Bedworth sewage outfall works. The purchase money is £150, and the expenses amount to over £25.

Hoddesdon U.D.C.—It was reported that the sale of mangolds on the sewage farm realised £54, an average of £8 per acre. This was felt to be very satisfactory.

Leyton U.D.C.—The council have made arrangements with Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham (sole licensees), to instal another patent "Fieldhouse" sedimentation tank of 500,000 gallons capacity.

Wakefield R.D.C.—It has been decided to carry out a drainage scheme for the Horserace end of Heath Common.

Westhoughton U.D.C.—The tender of Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, has been accepted for the supply of three 70-ft. diameter patent "Simplex" rotary sprinklers.

Witham (Essex) U.D.C.—The surveyor, Mr. P. Perkins, reports that the sale of the mangold and kohlrabi grown on the sewage farm yielded £119, compared with £168 last year. The acreage was the same as before, but the crop was smaller.

Worcester T.C.—The council have authorised the committee having charge of the sewage disposal system to visit the works at Birmingham, Guildford and Withington, with a view to deciding upon an improved system of sewage works.

WATER, GAS, AND ELECTRICITY.

Coleraine U.D.C.—The question is under consideration of constructing a covered storage tank at the Ballyversal waterworks.

Doncaster R.D.C.—It was reported on Tuesday that a letter had been received from the town clerk of Leeds regretting that, in view of the delay of the council in coming to a decision on the matter, it is impossible for the Leeds Corporation to proceed further in the matter of a water supply to the Doncaster district in the next session of Parliament.

Fifeshire C.C.—It has been agreed by the Vale of Leven District Committee to carry out a scheme for the improvement of the local water supply, at an estimated cost of £8,750.

Leyland U.D.C.—A new distributing main is to be provided, at an estimated cost of £600.

Longtown R.D.C.—Having been urged by the Cumberland County Council to consider the question of a water supply for Bolton Fell and district, the rural district council have decided to request Sir Richard Graham to give them his terms for water.

Newmill U.D.C.—Plans have been passed for a new reservoir at Goose Holes, estimated to cost £5,200. The work will be carried out under the direction of Messrs. Marriott, Son & Shaw, engineers.

Rhyl U.D.C.—In view of the differences between the Rhyl Council and the St. Asaph (Denbigh) Rural District Council, the Local Government Board suggest a conference of representatives of both bodies, presided over by one of the engineering inspectors of the board, in order to discuss the existing conditions of the water supply to Llanddulas. Both councils have agreed to the suggestion.

St. Just U.D.C.—With respect to the proposed water supply scheme, the Local Government Board have written that, having regard to the risk of the supply being intercepted by the operations of the china clay syndicate, it would be desirable that the council should adopt a different scheme.

Southwark B.C.—The Electric Light Committee in a report on the accounts of the electric light undertaking state that the year's working showed a nett loss of a little over £1,600, which was attributable to various causes, among which were the increase in the cost of coal, £393; removal of ashes, £244; increase in the sinking fund, £690; and repairs and maintenance, £165, in addition to which might be added the interruption in the economical working of the station during the progress of the installation of the new plant.

Teddington U.D.C.—On Monday it was decided to obtain tenders for the electric lighting at the sewage disposal works, and to complete the scheme as approved by the Local Government Board.

Thakeham R.D.C.—Tenders are to be obtained for works of water supply at Storrington, which are estimated to cost £5,172.

Torpoint U.D.C.—With regard to the matters referred to arbitration in connection with electric light, the award was favourable to the council on every point. At the request of the Electric Light Company, it was decided to meet them to discuss the question of entering into an agreement with regard to private lighting.

Wellington U.D.C.—Owing to a shortage in the water supply it has been resolved to provide forthwith a second borehole and pumping machinery, and that expert advice as to the most suitable position for the borehole be obtained.

MISCELLANEOUS.

Brighton T.C.—With respect to the proposed track less trolley omnibuses between Hove and Brighton, for which powers have been obtained, the Brighton Corporation have agreed that the Hove Corporation should be informed that the Brighton Council were unable to agree to the adoption of the over-running system, and that unless the Hove Corporation agreed forthwith to adopt the under-running system, application would be made for the Local Government Board to appoint an arbitrator.

Dawlish U.D.C.—The surveyor, Mr. S. F. C. Churchward, has submitted a plan for the erection of a miniature rifle range at the Knowle on less costly

[illegible] than that originally proposed. It is estimated that the new scheme could be carried out for £[illegible]. It was [illegible] until the Local Government Board's reply to the council's communication to them on the subject has been received.

Hampton U.D.C.—It was decided on Tuesday to pay half-wages to employees who have joined His Majesty's Forces.

Teddington U.D.C.—On Monday it was decided to [illegible] the expense with a view to escape [illegible] and to apply to the Local Government Board for sanction to a loan to defray the cost.

Torpoint U.D.C.—A recommendation of the Highways Committee that the council's employees' wages be increased [illegible] by 2s. per week and the [illegible] per hour has been adopted.

PERSONAL.

Mr. F. D. Tomlinson, assistant borough surveyor of Dewsbury, has had his salary raised from £175 to £[illegible] per [illegible].

Mr. Powell, a member of the surveyor's staff, has been appointed assistant surveyor to the Sedgefield Rural District Council, at a salary of £104, rising to £130.

Mr. F. Britton, surveyor to the Dore Rural District Council, has been appointed surveyor to the Hereford Rural District Council, at a salary of £150, rising to £160.

Mr. D. Elliott, of Bloomfield, Belfast, has been appointed assistant surveyor for portions of Ballymoney and Antrim rural districts under the Antrim County Council.

Mr. J. Paton, borough surveyor of Plymouth, was, on Monday last, formally appointed "acting borough surveyor" of Greater Plymouth—the borough having been enlarged by the inclusion of the whole areas of Devonport and Stonehouse—"until further orders." The other chief officers were dealt with similarly.

Mr. T. L. Brown, of the burgh surveyor's offices, Arbroath, has been appointed burgh surveyor of that town in succession to Mr. P. C. Smith, now burgh engineer of Dunfermline. Mr. Brown, who is only twenty-nine years of age, is a native of Hawick, where his father, Mr. Charles Brown, filled the position of burgh and water engineer.

Mr. J. Richard Heath has been appointed borough surveyor of Swansea. Mr. Heath is thirty-six years of age, is a member of the Institution of Municipal and County Engineers, and holds the diploma of that institution, and is also a member of the Royal Sanitary Institute. He was articled to Mr. F. Bettany, borough engineer and surveyor of Burslem, and on the expiration of his articles he was appointed an assistant in that office, and served in that capacity for a period of two years. At the end of that time he was appointed deputy borough surveyor of Burslem, which position he held for a period of over ten years. On the amalgamation of the six Pottery towns taking place over four years ago, Mr. Heath was appointed deputy borough surveyor to the newly constituted county borough of Stoke-on-Trent, and has held this appointment up to the present. The county borough of Stoke-on-Trent was formed by the amalgamation of the county borough of Hanley, the boroughs of Burslem, Stoke-on-Trent and Longton, and the urban districts of Tunstall and Fenton. Mr. Heath has been actively engaged in bringing into working order the arrangements of the six separate towns, including the entire reorganisation of the borough surveyor's staff, and has thus had a unique and valuable experience in dealing with many and difficult problems which have necessarily arisen in connection with this work.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY SURVEYOR in the South of England has vacancy for Articled Pupil. Waterworks and sewage disposal works.—Box 1,485, office of The Surveyor, 24 Bride-lane, Fleet-street, London, E.C. (2,087)

EAST SUSSEX COUNTY COUNCIL.

Wanted temporarily, a Surveyor and Draughtsman in the County Surveyor's Department.

The person appointed must have a good knowledge of Surveying, Levelling, &c., and preference will be given to one who has had experience in the use of the Theodolite.

Applications, stating age, qualifications, &c., and accompanied by not more than three recent testimonials to be sent to the undersigned on or before Tuesday, November 24, 1914.

Salary £78 per annum.

E. J. WOOD, Assoc.M.Inst.C.E.,
County Surveyor.

County Hall,
Lewes.
November 11, 1914. (2,086)

BARKING TOWN URBAN DISTRICT COUNCIL.

TO ROAD CONTRACTORS.

RIPPLE-ROAD WIDENING No. 1 (EASTBURY ESTATE).

The above Council invite Tenders for the execution of the undermentioned works:—

(a) For the construction of about 580 lin. yds. of 9-in. diameter glazed stoneware pipe sewer, and about 640 lin. yds. of 9-in. and 12-in. diameter glazed stoneware pipe surface-water drain, together with manholes, &c.

(b) For the widening of the carriageway and construction of new footway, kerbing, channelling, and appurtenant works, for a distance of about 700 lin. yds.

Plans may be seen and copies of Conditions of Contract, Specification, Bills of Quantities, and Forms of Tender, may be obtained upon application to Mr. R. A. Lay, Assoc.M.Inst.C.E., Acting Surveyor to the Council, Public Offices, Barking, on and after the 18th inst.

The Contractor whose Tender is accepted will be required to enter into a Contract under seal with sufficient sureties for the due performance thereof, to pay the trade union rates of wages in force in the district, to observe the recognised hours of labour, and to employ as far as possible workmen resident in the district of Barking Town.

Tenders, endorsed "Ripple-road Widening, No. 1," may be delivered to the Council at 7 p.m. on Tuesday, 24th November next, or be sent by post, or delivered, to the undersigned by the date and time mentioned.

The Council reserve the right to accept a separate Tender for each of the above sections, and do not bind themselves to accept the lowest or any Tender.

(By order)
E. A. PRATT,
Acting Clerk to the Council.

Public Offices,
Barking.
November 11, 1914. (2,085)

EAST SUFFOLK COUNTY COUNCIL.

MAIN ROADS.

TENDER FOR TAR OR SURFACE TARRING.

The above Council invite Tenders for the supply of Refined Tar, Dehydrated Coal Tar, or Tar supplied direct from Gasworks delivered to the various Railway Stations, Wharves, Docks, &c., within the County in such quantities and at such times as directed during the year ending 31st March, 1916.

Specification and Form of Tender can be obtained on application to the undersigned, and applicants are requested to state for which grade of Tar they wish to tender.

The Council does not bind itself to accept the lowest or any Tender, and reserves the right to accept Tenders for any portion of the requirements.

Tenders, endorsed "Tar," must be delivered at the County Hall, Ipswich, on or before 10 a.m. on the 23rd day of November, 1914.

(Signed) W. JERVIS,
County Road Surveyor.

County Hall,
Ipswich.
November 12, 1914. (2,088)

USES OF THE HYDRAULIC MINING CARTRIDGE.*

By James Todd, M.I.M.E., F.G.S.

The difficulty of removing rock and other material in places where the shock attendant upon blasting operations would be damaging and dangerous to surrounding strata or structures, is one which has not hitherto been thoroughly overcome.

The enormous initial power generated by the sudden decomposition of explosive substances has enabled great quantities of natural or artificial beds to be displaced, and a great portion of the work of the civil and mechanical engineer is involved either directly or indirectly in operations of this kind. The objection to the use of explosives, however, in many circumstances is that the effect of blasting can seldom be harnessed or controlled so as to prevent the disintegration of the material beyond the area which it is desired to dislodge. . . . Pulverisation by explosives involves enormous waste of power, as it usually represents great excess of explosive charge; in other words, the use of explosives must always either the risk of accident through an insufficient charge or the production of misapplied energy.

The hydraulic mining cartridge differs from all other mechanical substitutes for blasting. It is not worked on the principle of the wedge, and consequently the power expended in forcing a wedge into the hole is saved. Instead of employing a wedge, the disrupting effect is obtained by means of a number of small rams or presses working at right angles from a strong cylinder of steel. In order to make these rams more effective in their operation, by obtaining a greater travel from their original position, they are made of a duplex or telescopic form, one part sliding and fitting upon the other. In some cartridges these pistons operate from each side of the cylinder alternately, thus greatly increasing the travel. To retain the rams in position a sliding plate is used fitting in grooves in the barrel. This is so formed and secured that it is perfectly rigid and firm when the machine is in operation, but is readily removable if it is desired to detach or replace any of the rams. By a suitable arrangement of passages a communication is made between each of the rams, whereby simultaneous action is obtained. Machines are made of various diameters—viz., 2½ in., 3¼ in., and 4 in.—and of various lengths, say with 8, 6, or 5 rams, the smaller diameters having the larger number of rams. Pressures of 3, 4, or 5 tons per square inch are usual, so that machines are made to withstand great stresses.

The Pump. The cartridge is operated by means of a pump, to which it is directly connected by a pipe. The pump is of special design. At the commencement of the supply of water it is desirable that the latter should be supplied in such quantities as to fill up quickly all the spaces within the rams and passages, while at the same time allowing the operator, when the rams begin to move and the pressure to increase, to supply a less quantity of water, but at a greater pressure, to complete the final operations of the rams.

In practice it is found possible so to arrange the hydraulic cartridge holes as to enable much greater areas of material to be moved than could be done with a large quantity of explosive, while in some cases the displacement has been greatly extended by the use of small-sized boreholes towards which the slowly developing line of least resistance can assert itself. In other words the power exerted by the rams can be controlled, after a little experience, so that the full pressure can be usefully applied.

USE IN RESERVOIRS, DOCKS, HARBOURS, AND CANALS.

The operations in these places have all certain features in common which allow of their being classed together, and they may be divided into three classes.

(a) In Open Trenches. The difficulty of removing rock from confined spaces where it is necessary that no shock or vibration should be transmitted to surrounding strata is a very vital one. The introduction of the hydraulic cartridge into this class of work will, it is hoped, help to solve this question. During the past few years it has been thoroughly tested under most varied conditions and in all classes of deposits.

The work in trenches usually proceeds as follows: A number of holes are drilled, say, 2 ft. 3 in. back from the edge of the rock, about 5 ft. apart, and 3 ft. to 5 ft. deep, according to circumstances. The holes are, when possible, bored by a power drill operating from a raised. By these means suitable holes, of diameters up to about 5 in., can be quickly drilled. The centre hole is pumped first and provides a loose end for those on each side. These are pumped in turn until the fast side is reached, where it may be found advisable to drill a small 1 in. diameter hole, say 9 in. from the fast side, to enable the cartridge to break the rock as close to the fast side as possible. Sometimes this method is varied by pumping off two centre holes simultaneously and placing the last holes 2 ft. from the fast side, leaving out the small diameter holes. In this case the holes could be 2 ft. 6 in. from the front edge, and two machines would be required.

Taking a trench 15 ft. in width and holes 3 ft. in depth, the first method would necessitate three cartridges and two 1-in. holes to get 100 cub. ft. of rock; while the second method would require only four cartridge holes to remove 112 cub. ft. During the operation of the machine it is possible to see the rock slowly fracturing at each turn of the handle. Work of this character has been done by the cartridge in connection with the Derwent Valley waterworks, and the Cwm Taff reservoir, Liverpool Corporation, and tests are now being made for the Abertillery water scheme.

(b) Under Water.—The appliance has been used in many cases under water, chiefly to remove rock, either from the sides of canals or from the sides of harbours and docks, where it was obviously impossible to use explosives, the machine being operated from the bank or from pontoons.

In the Alexandra Docks at Newport, and in the new dock at Swansea, the appliance has been used to break up ledges of rock occurring in the vicinity of walls which would have been damaged by the use of explosives. The holes were put in and the cartridges inserted under water by divers, and pressure was applied from the pump placed on a raft on the water.

(c) Dock or Harbour Walls. Hydraulic machines have been used for some years at the Dover Harbour works for the purpose of detaching the large concrete blocks used in the harbour walls. These blocks are of great size and weight. By inserting the drill hole along the bottom of the block and placing the cartridge about half-way under it, the whole mass is slightly lifted and tilted without breaking, and being thus released from its bed is easily lifted on to a wagon by a crane. Machines are being used for a similar purpose in other docks.

EXCAVATION OF FOUNDATIONS.

The question of the removal of concrete foundation beds by a method which would not involve explosive blasts and would avoid the slightest damage to machinery or buildings has been carefully studied recently by the writer, and had never been thoroughly solved until extended trials in all parts of the British Isles had been made.

The effect of powerful hydraulic pressure upon concrete is interesting. In the case of sandstone and shales there is comparatively slight crushing of the rock before the full pressure of the rams has the effect of causing the mass to bend; considerable pumping and consequent travel of the rams is then necessary before the rock finally begins to crack and break away. With concrete, however, there is usually a perceptible interval during which the rams are crushing or compressing the material, and no movement is noticeable; after this is accomplished a few more thrusts of the rams cause the whole mass to break up without any indications of bending. It may still be necessary to continue to apply pressure and to increase the size of the breaks in the mass, but the greatest shattering effect will have been accomplished at the first disclosure of the cracks, the pressure required to break the mass afterwards gradually diminishing.

In such material explosives invariably have the effect of "hacking a way through" by the shortest direction to the unsupported edge, pulverising the mass, but failing to take advantage of pressure gently applied, by means of breaks, which spread and widen, and to utilise the weight of the concrete itself to increase the scope of the operation. Numerous experiments in this class of work show that 60 to

* From a paper read at the last meeting of the Society of Engineers.

[illegible]

[illegible] diameter holes 3 ft. away and in line, to which the [illegible] could be broken all across by two cartridges and two small diameter holes, amounting to 124 cub. ft. of material.

[illegible] material per thrust, the vertical small diameter holes [illegible] moved per thrust is 67 cub. ft. The effect of lifting up is to break a larger quantity of material and in much larger pieces than is the case with vertical holes. With the latter the concrete is found to be very well broken up, and ready for handling without the further use of tools. Horizontal holes, on the other hand, are more suitable for beds where foundation bolts are embedded in the concrete.

[illegible] for this machine as the removal of concrete beds. The following recent case is a typical example. At a municipal electricity works the cartridge was used to remove the main engine-room foundation bed. [illegible] tions, many of them within the same building, were very valuable Lancashire and water tube boilers, electrical and steam engines, and the main switch board and cables. Needless to say, the work had to be carried out with as little vibration or shock as possible. Explosives were out of the question, and the ordinary method of hammer and wedge would have proved an extremely long, tedious, and expensive process. The bed consisted of a solid mass 14 ft. 6 in. wide, 26 ft. long, and 10 ft. deep, composed of hard cement concrete for the most part, and reinforced with numerous foundation bolts.

It was considered unnecessary to instal power drills on the work, and the holes in consequence were drilled by hand. The majority of these were horizontal, and were put in by means of an ordinary twist drill and ratchet machine by two men. These men could drill fairly easily 3 ft. per hour. One hydraulic cartridge only was employed. The general procedure was to keep the drillers at work putting in holes all round the side of the concrete, the machine following when two or more holes were ready. The holes were on an average 6 ft. 6 in. apart, and from 2 ft. 6 in. to 3 ft. below the surface in the case of horizontal holes. The vertical holes were drilled only in special places to trim down the vertical edge, and in these cases the measurements were about the same. The employment of shot holes to form a breaking point was considered unnecessary.

The *débris* thus broken was removed by a gang of six men, who were kept busily employed with pick and shovel, and wedges were necessary only to break up the larger pieces to a suitable size for handling. It was found that the amount of material broken up in the course of three or four shots was quite sufficient, in consequence of the limited and cramped working area, to keep the men busily employed for the rest of the day. Had it been possible to place more men on the bed there is no reason why a much better output should not have been attained, but in this case it would have been necessary to break open the wall in several places, which was not considered advisable. The whole bed, weighing approximately 200 tons of concrete, was removed in twenty working days. About sixty shots were necessary to complete the work, making an average of nearly 3½ tons per thrust.

The cost of the work was as follows: Labour per day, including operator, drillers, navvies, and foremen, £2 15s.; amount of material removed—average 10 tons per day, 4s. 9d. per ton.

The above cases will be sufficient to show that with a mechanical substitute for blasting capable of exerting a total pressure of 150 or 200 tons upon rock, coal, concrete, masonry, &c., and in such manner as to cause no shock to the material in which it is operated, there should be possibilities of usefulness to engineers not previously contemplated.

SOME RECENT PUBLICATIONS.*

Machine and Structural Design. By H. D. Hess, M.E. Price 12/6 net. London: Chapman & Hall, Limited.

The author of this very practical and decidedly useful work is Professor of Machine Design at Sibley College, Cornell University, was formerly designer and computor for the mechanical department of the Pencoyd Ironworks and the American Bridge Company, and is a member of the American Society of Mechanical Engineers. The book is intended for the author's students in engineering design, the problems chosen [illegible] "those on the border line between [illegible] and [illegible] engineering," and the determination of stresses made, not only graphically, but also by other usual methods. The author states that he is indebted to many manufacturers, and to *Engineering News* especially among periodicals. He hopes that his book may serve, not only as a text-book, but also as "a satisfactory reference book for designers whose work is not too highly specialised."

The general character of the book may be indicated by stating that it is what the reader might expect from the above premises, the author being intelligent and painstaking. Being American in its scope, it deals less with field engineering and more with works engineering than would be the case if a book with the same title were written for British engineers. We find, accordingly, that a considerable amount of space is devoted to mill buildings, chimneys, works equipment and storage bins. The first nineteen pages are occupied with a good summary of the properties of important materials (not including wrought iron). The next three chapters deal respectively with "graphics," treated briefly and generally, "stresses in structures," with studies of force polygons, and "the algebraical determination of stresses," chiefly with respect to trusses. A short but useful chapter on "influence diagrams" follows, and the author then proceeds to consider the design generally of tension and compression pieces, beams and columns. This brings us to p. 100. The next ninety pages are occupied with specific applications of the methods of design, the subjects being girders for conveyors, trusses, bents and towers; a steel mill building; a railway plate girder; crane frames; and girders for travelling cranes. The next thirty-four pages are occupied by a good summary of the main elements of reinforced-concrete design, followed by a short chapter on "foundations."

The next chapter—on chimneys—includes three practical examples—brick, steel, and reinforced concrete. A chapter of sixteen pages on retaining walls is followed by one of twenty-five pages on "bins," in which the determination of stresses, graphically and by formulæ adapted to various conditions, is carefully explained. The next two chapters—on "shop floors" and "walls and roofs"—include a considerable amount of detailed designing, the designs for window frames being an unexpected but perhaps useful feature. Specifications for structural steelwork are then given, with considerable detail, and are followed by other useful specifications. The book concludes with a series of 195 practical problems, the answers to which are given separately. There is an index of ten pages. We do not find "wrought iron" in the index, and it seems, therefore, that it is not considered a material of sufficient importance to be included in a work of this character. It should further be understood that the author has considered only a small range of materials, these being, no doubt, those of most importance from the American point of view. The diagrams, of which there are 430, including members of groups of diagrams, are well drawn, and well suited to their purpose. For British readers the book may be recommended as dealing with a range of subjects of much practical importance, and furnishing a considerable number of practical examples of design by fairly simple methods.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.Inst.C.E., Borough Engineer, Cheltenham.

WEST MIDLAND DISTRICT.

A meeting will be held at Birmingham on Thursday, November 26th.

Agenda.

5.30 p.m.—Meet at the Council House, Birmingham.

To elect Executive Committee for the ensuing year.

Discussion on paper by Mr. E. J. Goodacre, Assoc.M.Inst.C.E., assistant borough surveyor, Shrewsbury, entitled "Timber and its Relation to the Building By-laws."

F. C. Cook, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Municipal Offices,
Nuneaton.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. Horace Boot, M.I.E.E., M.I.Mech.E., Tunbridge Wells and Westminster.

President-Elect—Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

ANNUAL MEETING IN LONDON.

The sixth annual general meeting will be held in London on Saturday, November 28th.

Programme.

11.45 a.m.—Meet in the Council Chamber, No. 4 Southampton-row, London, W.C.

12 noon.—Annual general meeting.
Minutes of last meeting.
Presentation of annual report of council.
Announcement of result of ballot for election of council for the year 1914-15.
Any other business.

1 p.m.—Adjourn for lunch.

2.30 p.m.—Re-assemble in Council Chamber.

2.45 p.m.—Presidential address.

Discussion on the following papers to be presented to the meeting:—

"A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts," by G. Belson Chilvers, M.R.San.I. (member).

"Housing of the Working Classes," by Edward Whitwell (member).

"The Future Control and Maintenance of Rural Roads," by J. S. Wooddisse (member).

The papers will be taken as read, and advance copies may be obtained on application to the secretary, and will be forwarded as soon as the papers are in print.

B. Wyand,
39 Victoria-street, S.W. *Secretary*

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH SURVEYOR AND INSPECTOR.—November 14th.—Corporation of Monmouth. £130 per annum.—Mr. Bickerton H. Deakin, town clerk.

SEWAGE WORKS MANAGER.—November 14th. Ashton-in-Makerfield Urban District Council. 50s. per week.—Mr. Albert Sykes, clerk, Council Offices.

ROAD FOREMAN.—November 16th.—Corporation of Birmingham. 40s.—45s. per week.—Mr. H. E. Stilgoe, city engineer and surveyor.

ROAD FOREMAN.—November 16th.—Corporation of Bootle. £3 per week.—Mr. J. S. Tumilty, town clerk.

CLERK OF WORKS.—November 16th.—Gellygaer Urban District Council. £2 5s. per week.—Mr. Frank T. James, clerk.

ENGINEERING ASSISTANT.—November 17th.—Hackney Borough Council. £130—£180 per annum.—Mr. N. Scorgie, borough engineer and surveyor, Town Hall, Hackney, N.E.

ROAD SURVEYOR.—November 20th.—Dore (Herefordshire) Rural District Council. £100 per annum.—Mr. R. Moore, clerk.

TEMPORARY ASSISTANT.—November 21st.—Kettering Urban District Council. £80 per annum.—Mr. John Bond, clerk.

TEMPORARY ENGINEERING ASSISTANT.—November 21st.—Corporation of Exeter. £4 4s. per week.—Mr. Thos. Moulding, city engineer and surveyor, Municipal Offices, Southernhay West, Exeter.

DISTRICT SURVEYOR OF ROADS.—November 21st.—Lancashire County Council. £200—£325 a year.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

CLERK OF WORKS.—November 24th.—West Suffolk County Council. £2 15s. per week.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

RESIDENT ENGINEER.—November 24th.—Easington Rural District Council.—Mr. W. G. W. Noble, acting clerk, Council Offices, Easington, Easington Colliery, Co. Durham.

SURVEYOR AND INSPECTOR.—November 24th.—Wimborne and Cranborne Rural District Council. £120 per annum.—Mr. M. Luff, clerk, Council Offices, Wimborne.

CLERK OF WORKS.—November 25th.—Petersfield Rural District Council. £2 10s. per week.—Mr. A. J. C. Mackarness, clerk.

HIGHWAY SURVEYOR.—November 25th.—Llanybyther Rural District Council. £45 per annum.—Mr. J. Ernest Lloyd, clerk, 28 High-street, Lampeter.

JUNIOR ENGINEERING ASSISTANT.—November 25th.—Corporation of Bolton. £65 per annum.—Mr. Samuel Parker, town clerk.

ROAD FOREMAN.—November 27th.—Cannock Urban District Council. 30s. per week, with house rent. Mr. R. Blanchard, engineer and surveyor, Council Offices.

ASSISTANT COUNTY SURVEYORS.—November 30th.—Cornwall County Council. £150—£200.—Mr. Christopher L. Cowlard, clerk, County Council Offices, Bodmin.

SURVEYOR.—December 5th.—Pontypool Rural District Council. £100 per annum. Mr. T. Watkins, clerk, Club Chambers, Pontypool.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

ASSISTANT SURVEYOR.—Corporation of Tenby.—Mr. B. Morley, borough surveyor.

ASSISTANT ENGINEER.—Lagos Municipal Board of Health, Nigeria. £300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department of the Government of the Gold Coast. £350—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ROAD SURVEYOR.—Hipperholme Urban District Council. The Clerk, 4 Harrison-road, Halifax.

MUNICIPAL COMPETITIONS OPEN.

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SOUTHEND.—December 4th.—Schemes for a tuberculosis hospital, for the corporation. Premiums £100, £50, and £25.—Mr. E. J. Elford, borough engineer.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

DURHAM.—November 14th.—For the erection of a dispensary, for the county council.—County Surveyor, Shire Hall, Durham.

KIRKCALDY.—November 14th.—For the erection of a sanatorium and other works, for the corporation.—Burgh Surveyor.

WELLS (Norfolk).—November 14th.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. H. Kennard, architect, 26 Great James-street, Bedford-row, London, W.C.

WAKEFIELD.—November 16th.—For the erection of an office for use at the cattle market, for the corporation.—Mr. J. P. Wakeford, city surveyor.

DUNDALK.—November 16th.—For sinking a well and erecting a pump, for the rural district council.—Mr. P. Cahill, Francis-street, Dundalk.

GREETLAND.—November 16th.—For the erection of public lavatories and waiting-room, for the urban district council.—Messrs. R. Horsfall & Son, architects, 22A Commercial-street, Halifax.

WIGAN.—November 16th.—For the extension of the swimming bath, for the corporation.—Mr. A. T. Gooseman, borough engineer.

HORNSEY.—November 16th.—For the erection of an electric lighting station, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

EDINBURGH.—November 16th.—For the erection of garages, for the corporation.—Mr. J. A. Williamson, architect, Public Works Office, City Chambers, Edinburgh.

BRIGHTON.—November 17th.—For demolishing and rebuilding 83 Grand-parade, for the corporation.—Borough Surveyor, Town Hall.

GODSTONE.—November 17th.—For the erection of a cottage at the sewage works, and laying a sewer, for the rural district council.—Mr. T. C. Barralet, surveyor, Station-road, West Oxted.

BARNET.—November 17th.—For the erection of council offices and an underground convenience, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor.

HOVE.—November 18th.—For the construction of a public lavatory, for the corporation.—Borough Surveyor.

CHESTER-LE-STREET.—November 18th—December 16th.—For the erection of fifty houses, for the urban district council.—Messrs. Boyd & Groves, architects, Emerson Chambers, Newcastle-upon-Tyne.

GLOUCESTER.—November 19th.—For the erection of a tuberculosis block, for the corporation.—Mr. R. Read, city surveyor.

CAMBRIDGE.—November 19th.—For additions to the Guildhall, for the corporation.—Mr. J. Julian, borough surveyor.

STAMFORD.—November 20th.—For the erection of twenty-four cottages, for the corporation.—Mr. F. R. Ryman, borough engineer.

HAMPSHIRE.—November 20th.—For the erection of a new school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BARNSLEY.—November 21st.—For the erection of a school, for the Education Committee.—Mr. E. W. Dyson, architect, Regent-street, Barnsley.

HUDDERSFIELD.—November 21st.—For the construction of an open-air school and approach roads, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

BRIXHAM.—November 21st.—For the erection of sixteen houses, for the urban district council.—The Surveyor.

BARROW.—November 23rd.—For the erection of a public library, for the corporation.—Borough Engineer and Surveyor.

HENDON.—November 23rd.—For the erection of a bungalow, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

LONDON.—November 24th.—For the erection of an annexe to engine-house at Abbey Mills pumping station, for the county council.—Chief Engineer, Spring-gardens, S.W.

SELBY.—November 24th.—For the construction of a subway road and retaining walls, for the urban district council.—Mr. Bruce McG. Gray, Council Offices, Selby.

CHESTER.—November 24th.—For the erection of a school, for the Administrative Committee.—Messrs. J. M. Davies & Sons, 14 Newgate-street, Chester.

MALDON.—November 24th.—For the construction of the Tollesbury waterworks, for the rural district council.—Mr. W. Almond, engineer and surveyor, 6 Market-hill, Maldon, Essex.

WEST SUSSEX.—November 24th.—For the erection of a school, for the Joint Education Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

FINCHLEY.—November 25th.—For the erection of an overground convenience, for the urban district council.—Mr. C. J. Jenkin, surveyor.

BRISTOL.—November 26th.—For the reconstruction of the cattle market, for the Market Trustees.—Mr. P. Addis, The Exchange, Corn-street, Bristol.

HARROW.—November 28th.—For the erection of a ward block at the isolation hospital, for the urban district council.—Mr. J. Bennetts, surveyor.

HOLMFIRTH.—November 30th.—For the construction of a reservoir and laying cast-iron mains, for the urban district council.—Messrs. J. Barrowclough & Sons, engineers, Cross-roads, Holmfirth.

MANCHESTER.—December 2nd.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

MANCHESTER.—December 2nd.—For the construction of a retaining wall, for the gas department.—Mr. F. A. Price, superintendent, Town Hall.

BEDFORD.—December 4th.—For laying 2 miles of 4-in. and 3-in. cast-iron mains, with sluice valves and hydrants, for the rural district council.—Mr. Arthur J. Martin, 7 Victoria-street, Westminster, S.W.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

Iron and Steel.

DARTFORD.—November 16th.—For supplying and laying cast-iron pipes for the electricity works, for the urban district council.—Mr. W. Kay, clerk.

EDMONTON.—November 16th.—For the supply of cast-iron socketed and flanged pipes, and disc and sluice valves, for the urban district council.—Mr. C. Brown, engineer.

TORQUAY.—November 17th.—For laying 3,700 yds. and 6,150 yds. respectively of 15-in. and 14-in. cast-iron pipes, for the corporation.—Mr. Samuel C. Chapman, water engineer.

OSWESTRY.—November 23rd.—For providing and laying 4-in. and 3-in. cast-iron mains, sluice valves, fire hydrants, and air valves, for the rural district council.—Messrs. Berrington, Son & Watney, Prudential Chambers, Wolverhampton, and 28 Victoria-street, Westminster, S.W.

ISLE OF WIGHT.—November 25th.—For supplying and fixing a conical buoy and other works at the sewer outfall, for the rural district council.—Mr. H. Eldridge Stratton, clerk, 30 Pyle-street, Newport, I.W.

BIRKENHEAD.—December 7th.—For the construction of pipe line consisting of 11¾ miles of cast-iron and steel pipes, tunnel and tanks, for the corporation.—Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

BIRKENHEAD.—December 7th.—For the supply of sluice valves, automatic valves, boxes, and gratings, for the corporation.—Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

Roads.

HASTINGS.—November 14th.—For the supply of 1,000 yds. of unbroken blue stone, for the rural district council.—Mr. D. Paine, surveyor, Stonelynk Farm, Fairlight, Hastings.

WAKEFIELD.—November 16th.—For forming private streets, for the corporation.—Mr. J. P. Wakeford, city surveyor.

EAST SUSSEX.—November 16th.—For the supply of materials, haulage, and team labour, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

LUTON.—November 16th.—For the supply of broken slag, for the year ending November 30, 1915, for the corporation.—Borough Engineer.

NORTHUMBERLAND.—November 16th.—For supplying, breaking, and carting stone, and also for the supply of tar, pitch, and creosote oil, for the county council.—County Surveyor, Moot-hall, Newcastle-on-Tyne.

FARNHAM.—November 17th.—For the supply of granite, for the urban district council.—The Surveyor.

ALTON.—November 17th.—For the supply of granite, for the urban district council.—Mr. G. Bertram Hartfree, Town Hall, Alton, Hants.

WEST HARTLEPOOL.—November 18th.—For the supply of concrete kerbstone flags, scoriæ, whinstone channel blocks, paving setts, hand, machine, and unbroken whinstone, pitch, tar, and lime, for the corporation.—Mr. N. F. Dennis, borough engineer and surveyor.

SOUTHAMPTON.—November 18th.—For the hire of steam rollers during the year ending March 31, 1916, for the county council.—County Surveyor, The Castle, Winchester.

SOUTHAMPTON.—November 18th.—For the supply and delivery of tools for use on main roads, for the county council.—County Surveyor, The Castle, Winchester.

SOUTHAMPTON.—November 18th.—For the supply of stone for the repair of the main roads, for the county council.—County Surveyor, The Castle, Winchester.

LEWISHAM.—November 18th.—For supplying and laying wood paving, for the borough council.—Borough Surveyor, Town Hall, Catford.

WEST HARTLEPOOL.—November 18th.—For the supply of Yorkshire and concrete kerbstone, flags, scoriæ and whinstone channel blocks, paving setts, and other materials, for the corporation.—Mr. N. F. Dennis, borough engineer and surveyor.

WEST SUFFOLK.—November 23rd.—For the supply of tar for the surface treatment of roads, for the county council.—Mr. W. Lionel Jenkins, county surveyor, Bury St. Edmunds.

BEACONSFIELD.—November 23rd.—For the supply of 1,000 tons of 2½-in. granite, for the urban district council.—Mr. H. Sargeant, surveyor.

SOUTHGATE.—November 23rd.—For private street works, for the urban district council.—Mr. C. G. Lawson, surveyor.

SHOREHAM.—November 23rd.—For the supply of 600 tons of granite, quartzite, or Elvan stone, for the urban district council.—Mr. A. W. Nye, surveyor.

SELBY.—November 24th.—For the construction of a subway road and retaining walls, for the urban district council.—Mr. R. B. McG. Gray, surveyor.

WHITSTABLE.—November 24th.—For the supply of 1,000 cub. yds. of picked flints, and 200 cub. yds. of hoggin, for the urban district council.—Mr. F. Laurens, surveyor.

MIDDLESBROUGH.—November 25th.—For the repaving of back streets, for the corporation.—Mr. S. E. Burgess, borough engineer.

WARWICKSHIRE.—November 25th.—For the supply of road material, broken and unbroken, for the county council.—Mr. John Willmot, county surveyor, 6 Waterloo-street, Birmingham.

ELLESMERE PORT.—November 28th.—For making up certain streets, for the urban district council.—Council Offices.

BARTON-UPON-IRWELL.—December 5th.—For private street works, for the rural district council.—Mr. A. H. Mountain, Union Offices, Patricroft, near Manchester.

KENT.—December 5th.—For the supply of Guernsey, Jersey, or Alderney granites, Clee Hill basalt, Leicestershire granites, Penlee, St. Keverne, or other Cornish granites, Northumberland whinstone, Penmaenmawr or other Welsh granites, quartzite, Norway granite, Quenast or Lessines, 35,000 tons of tarred-macadam, 15,000 yds. of surface-picked or grubbed flints, and 5,000 yds. of Kent rag, for the Bridges and Roads Committee.—Mr. W. B. Prosser, clerk, Sessions House, Maidstone.

Sanitary.

KENDAL.—November 16th.—For the construction of stoneware pipe sewer and a concrete outfall channel, for the corporation.—Mr. F. W. Oxberry, borough engineer.

ORSETT.—November 18th.—For the construction of sewers, and providing engines, compressors, ejectors, and other works, for the rural district council.—Messrs. H. Walker & Son, Albion Chambers, Kingstreet, Nottingham.

PAIGNTON.—November 23rd.—For laying a sewer, for the urban district council.—Mr. C. O. Baines, engineer and surveyor.

PETERSFIELD.—November 25th.—For the construction of about 5 miles of pipe sewer with manholes, and sewage purification works, for the rural district council.—Messrs. Chambers, Smith & Adams, 53 Victoria-street, Westminster, S.W.

BARTON-UPON-IRWELL.—November 28th.—For the construction of new tanks, storm overflow, humus tanks, circular percolating filter, and other works, for the rural district council.—Mr. A. H. Mountain, surveyor, Union Offices, Green-lane, Patricroft, near Manchester.

BANBURY.—November 30th.—For the construction of sewage disposal works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

PONTEFRACT.—December 1st.—For scavenging work in certain parishes, for the rural district council.—Assistant Overseers.

BURTON-UPON-TRENT.—December 2nd.—For the reconstruction of about 470 yds. of 2 ft. 6 in. diameter brick and concrete sewer, for the corporation.—Mr. George T. Lynam, borough engineer and surveyor.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

BRISTOL.—November 16th.—For the supply of stores, for the Sanitary and Improvement Committee.—City Engineer.

WEST HARTLEPOOL.—November 18th.—For the supply of road materials, sewer pipes, pitch, tar and lime, for the corporation.—Nelson F. Dennis, borough engineer and surveyor.

NOTTINGHAM.—December 3rd—For the supply of cement, blue lias lime, red bricks, blue bricks, timber, earthenware pipes, iron castings, gullies, Yorkshire flags, kerb, granite setts, broken granite, ironstone slag, chippings, river gravel, coal, picks, shovels, scoops, ironmongery, scavenging, and other brushes, disinfectants, refined tar, pitch, and creosote oil, for the corporation.—Mr. Arthur Brown, city engineer, Guildhall.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted

ANNFIELD PLAIN.—For private street works, for the urban district council.—Mr. T. J. Brownsdale, surveyor:—

Elliot & Lormick, Annfield Plain	£129
J. Douglass, Newcastle-on-Tyne	127
J. T. Castle, Annfield Plain	122
Johnson & Strong, Stanley S.O., Co. Durham	114
Arthur & McHugh, Tanlotin S.O., Co. Durham	113
K. S. Ledger, Annfield Plain	113
T. Gatiss, Annfield Plain	112
Lee & Dunn, Annfield Plain	99

HINCKLEY.—For laying about 4 miles of water mains, erection of a workshop, and approach road, and the provision and fixing of wrought-iron fencing, for the rural district council.—Mr. E. H. Crump, engineer:—

Stimpson & Rolleston, Leicester	£1,713
H. Morley & Sons, Keighley	1,563
A. Ward, Derby	1,454
A. Jeffcote, Hinckley	1,410
A. Hyslop, Manchester	1,396
A. Palmer, Glenfield	1,391
W. Press & Son, London	1,325
E. Tukes, Tipton	1,321
G. Trentham, Birmingham	1,304
C. Jackson, Tipton	1,290
R. Brebner & Co., Edinburgh	1,251
A. Sykes, Nottingham	1,202
W. S. Scott & Co., Luton	1,100
H. Puller & Co., Glasgow	1,035
T. Rearsley & Son, Leeds	1,000
Hanney Brothers, Swansea	966
— Brown, Nuneaton	929
G. Greaves, Hinckley *	921

LEYTON. For the construction of a [illegible] concrete tank, [illegible] Mr. [illegible] H. [illegible]

[illegible]	£1,[illegible]
W. [illegible]	1,[illegible]
J. J. [illegible]	1,014
A. & S. Byrne, [illegible]	1,042
[illegible]	1,[illegible]
[illegible]	1,[illegible]
W. & C. [illegible]	1,118
[illegible]	2,040
F. J. [illegible]	[illegible]

NORTH DARLEY. A supply for the supply of [illegible] tons of [illegible] for the [illegible] engineer.—Mr. L. F. Lowe, surveyor.

Ellis & Everard, Barrow Hill, Leicester. £[illegible]

ROMFORD. For the supply of [illegible] tons of granite, for the urban district council.—Mr. H. I. Baker, surveyor.

	Per ton at Romford G.E.Ry Station.
	s. d.
[illegible], Limited, Westminster	15 11
[illegible], Greenwich, S.E.	15 10
J. Mowlem & Co., Westminster	15 9
A. & F. Marsella, Gloucester-street, E.C.	15 6
Enderby and Stone, Stanton Granite Company, Leicester	14 11
Gaspar & Co., Leicester, for Guernsey granite	14 10
Croft Granite Company, near Leicester	12 11
Jees Hartshill Granite Company, Atherstone ..	12 2
C. Abell, Limited, Atherstone	12 2

WANDSWORTH. For making up certain streets, for the borough council.—Mr. P. Dodd, borough engineer.

Part of Mitcham-lane.—S. Lane, £441.
Part of Broadwater-road.—S. Lane, £425.

WILSDEN. For the extension of the asylum, Goodmayes, Essex, for the corporation.—Mr. J. G. Morley, borough engineer.

McLaughlin & Harvey, Brecknock-road, N.W.	£61,566
S. E. Moss, Southend	59,000
Thomas & Edge, Woolwich	58,891
W. S. Sharpson, Bow	58,257
Berry & Armstrong, Southend	57,829
Pattinson & Sons, Limited, Ruskington	56,170
A. N. Coles, Paddington	55,815
J. W. Jerram, Plaistow	55,394
W. J. Maddison, Canning Town	55,375
A. E. Symes, Stratford	53,961
F. J. Coxhead, Leytonstone	53,949
H. C. Horswill, Forest Gate*	53,949

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

NOVEMBER.

16.—Concrete Institute. Prof. Henry Adams delivers his Presidential Address. 7.30 p.m.

20.—Institution of Mechanical Engineers: Mr. G. Gerald Stoney, F.R.S., on "The Effect of Vacuum on Steam Turbines." 8 p.m.

26.—Institution of Municipal and County Engineers. West Midland District Meeting at Birmingham.

28.—Institution of Municipal Engineers: Annual General Meeting in London.

TENDERS WANTED.

BEDFORD RURAL DISTRICT COUNCIL.

GOLDINGTON WATER SUPPLY.

EXTENSIONS.

The Bedford Rural District Council invite Tenders for the Laying of about 2 miles of 4-in. and 3-in. Cast-iron Mains, with all necessary Sluice Valves, Hydrants, &c. The whole to be in accordance with Plans and Specifications prepared by Mr. Arthur J. Martin, M.INST.C.E., of 7 Victoria-street, Westminster, S.W., the Engineer appointed by the Council for the carrying out of the works.

The Drawings and Specifications, with Conditions, may be seen, and copies of Specifications and Bills of Quantities may be obtained, at the Office of the Rural District Council, No. 115 High-street, Bedford, or that of the Engineer (as above), upon payment of a deposit of One Guinea, which will be returned to *bonâ-fide* Tenderers on the letting of the Contract.

Sealed Tenders, endorsed "Goldington Water Supply," must be delivered to me at 115 High-street, Bedford, on or before 4th December, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WILLIAM PAYNE,
Clerk to the said Council.

115 High-street,
Bedford.
November 10, 1914. (2,083)

CITY OF NOTTINGHAM.

The Works and Ways Committee are prepared to receive Tenders for the Supply of the undermentioned Stores and Materials, the Contracts to commence on the 1st January next and to terminate on the 31st December, 1915:—

(A.) Cement.
(B.) Blue Lias Lime.
(C.) Red Bricks.
(D.) Blue bricks.
(E.) Timber.
(F.) Earthenware pipes, &c.
(G.) Earthenware pipes, &c. (Patent Joints).
(H.) Iron Castings, Iron Gulleys, &c.
(I.) Yorkshire Flags, Kerb, &c.
(J.) Granite Setts, Kerb, and Broken Granite.
(K.) Ironstone Slag, Chippings, &c.
(L.) River Gravel.
(M.) Coal.
(N.) Picks, Shovels, Scoops, &c.
(O.) Ironmongery.
(P.) Scavenging and other Brushes.
(Q.) Disinfectants.
(R.) Refined Tar.
(S.) Pitch.
(T.) Creosote Oil.

Forms of Tender may be obtained on applying to Mr. Arthur Brown, M.INST.C.E., City Engineer, Guildhall, Nottingham, on payment of a deposit of 5s. each, which will be returned on receipt of a *bonâ-fide* Tender, in accordance with the Specification, providing such Tender is not withdrawn and is delivered by the time stated below.

Patterns and Samples may be inspected at the Eastcroft Depot, London-road, Nottingham.

The Committee will not consider any Tender except on the authorised Form of Tender, which must be delivered to the undersigned, in the official envelope provided, on or before Thursday, 3rd December, 1914.

The lowest or any Tender will not necessarily be accepted, and Tenders will only be accepted from persons who conform to the conditions as regards paying the local standard rate of wages, &c., and to the working rules of the Nottingham District applicable to the various trades.

(By order)
W. J. BOARD,
Town Clerk.

Guildhall, Nottingham.
November 11, 1914. (2,081)

GRANITE.

The Alton Urban District Council invite Tenders for the Supply of Granite.

Forms of Tender may be obtained from the undersigned.

Sealed Tender to reach Mr. W. Bradley Trimmer, Clerk to the Council, not later than the 17th inst.

G. BERTRAM HARTFREE, F.S.I.

Town Hall,
Alton,
Hants. (2,084)

(Continued on p. xviii.)

FOR SALE.

THORNEYCROFT 8-ton Steam Wagon and trailer for sale; boiler tested to 350 lb.; thoroughly overhauled and in first-class working order.—Abdon Clee Stone Quarry Company, Limited, Ditton Priors, Bridgnorth. (2,080)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

PRACTICAL ROAD SURVEYOR or Foreman Manager to take charge of outside work in connection with the Hipperholme Urban District Council.—Apply by letter, stating qualifications, wages, &c., to the Clerk to the Council, 4 Harrison-road, Halifax, on or before 23rd November, 1914. (2,066)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. NOVEMBER 20, 1914. No. 1,192.

Minutes of Proceedings.

Extraordinary Traffic: The Time Limit.

The question of the time within which proceedings for extraordinary traffic expenses must be commenced is not always an easy one to answer. Under the Locomotives Act, 1898, sec. 12, sub-sec. (1) (*b*), such proceedings must be begun within twelve months of the time at which the damage has been done, or where the damage is the consequence of "any particular building contract, or work extending over a long period" within six months after the completion of the contract or work. The intention of the latter part of the sub-section is not to cut down the right given by the former part, but to give a right to recover expenses in respect of damage which would otherwise have been barred by the earlier clause. This seems so obvious a proposition that it hardly needs the *imprimatur* of judicial authority. But if any are inclined to doubt it they may be referred to the *dicta* of Lord-Justices Romer and Stirling in *Kent County Council* v. *Folkestone Corporation* (1905, 1 K.B., 620) in corroboration of this view of the effect of the statute. A more difficult point, raised in the same case, was whether, where a public authority have conducted extraordinary traffic, the sub-section excludes the operation of the Public Authorities Protection Act, 1893, which limits the time for proceedings for any act done in execution of any public duty or authority to six months after the act complained of. The decision was in the negative, with this qualification, however, that where the damage is caused by the acts not of the public authority's own servants but of an independent contractor, the operation of the Protection Act is excluded, whether the action is brought against the contractor or against the authority. But the chief controversy as to the interpretation of the sub-section of the Act of 1898 has gathered round the phrase—"any particular building contract or work extending over a long period." No definite rule can be laid down as to what contracts or works are within the clause—it is a question of fact in each case. One or two cases which have been decided may, however, serve as guides in the application of this provision. From these it appears that the haulage of timber purchased under a series of contracts from the owners of any estate is not a "work" within the meaning of the sub-section (*Norfolk County Council* v. *Green*, 68 J.P., 223). Neither is a contract for the delivery of stone in such quantities as the purchasers should from time to time direct during a certain year (*Bromley Rural District Council* v. *Croydon Corporation*, 1908, 1 K.B., 353).

In a rather more complicated case a county council contracted with a firm of builders to make alterations and additions to a building so as to convert it into an asylum, and afterwards contracted with another firm to erect a temporary asylum pending the completion of the alterations. Extraordinary traffic having occurred in the carrying out of the contracts the highway authority brought an action more than six months after the completion of the original contract, but within six months from the completion of the subsidiary contract. It was held that the claim for damage caused in carrying out the first contract was barred; in other words, the two contracts were not to be considered as together constituting one entire contract or work within the meaning of the clause (*Epsom Urban District Council* v. *London County Council* (1900, 2 K.B., 751). In another case a local authority were carrying out a road widening scheme, and employed a haulier to cart stone. Damage was done to certain roads in the course of the carrying out of the haulage contract, the work under which was completed six months before the widening of the road was finished. Proceedings were not commenced until after the expiration of the six months, and it was held that the claim was barred, except as to damage done within twelve months before the issue of the writ—that is to say, the whole works of road widening were not to be considered as constituting one "work" for the purpose of the time limit (*Kent County Council* v. *Folkestone Corporation*, *ubi supra*). But in the latter case a local authority contracted for the construction of a reservoir and the laying of two lines of pipes in connection with it. Damage to the highway was caused solely by the laying of one line of pipes, and proceedings were commenced more than a year after the laying of that line, but before the completion of the reservoir. And it was held that the whole of the operations constituted one "work," and consequently that the action was in time (*Carlisle Rural District Council* v. *Carlisle Corporation*, 1909, 1 K.B., 471). Another source of some controversy has been found in the apparently simple phrase, "the completion of the contract," but we must reserve comment upon this for a future occasion.

Public Health of Staffordshire.

The annual report of Dr. George Reid, the county medical officer of health for Staffordshire, is always an interesting document, and the account of the work of his department for the year 1913, which is now before us, forms no exception to the rule. We single out three matters for comment, not by way of criticism, but as examples of the sound work which is being accomplished for the improvement of the public health of the county. First, there is the systematic attempt to secure the abolition of privies. Some of the local authorities have done much good in this direction, but it appears that there is ample justification for special effort on the part of the county council to bring about this reform by utilising to the fullest extent the additional powers given them by the Housing and Town Planning Act. Local authorities can no longer justify inactivity on their part by professing that the law does not enable them adequately to enforce the substitution of water carriage for conservancy methods of excrement removal, for, by adopting certain clauses of the Public Health Acts Amendment Act, 1907, they can acquire the needful powers of compulsion. There can be no question that the continuance of conservancy methods tends to degrade the people and to discourage many from taking that interest in their homes without which all-round cleanliness can never be secured. This in itself would justify a radical change, but, when year by year the danger to health attending the system is more and more conclusively demonstrated, it is really incredible that so many local authorities should remain callous and require such constant spurring on to induce them to make what little progress there is being made. Without exception, the medical officers of health of the county have for a quarter of a century been pressing for reform in this matter, and year by year it is most depressing to gather from some of their reports that progress is so slow.

The next matter to which we desire to refer is the activity which is being displayed by many of the authorities of the county in the direction of improving housing conditions. The work of systematic inspection is, however, severely handicapped in certain districts owing to the inadequacy of the sanitary staff. For example, the medical officer of health for Biddulph reports that the development of that district has been so great that one man cannot cope with the work, especially when he has to act as surveyor as well as inspector of nuisances; and he goes on to recommend a separation of the two offices. We have consistently expressed the view that it is false economy to cut down the personnel of a public health department, and we need hardly say that we fully endorse the character of the change suggested for Biddulph. Lastly, there is the question of the reform of the by-laws in districts in which those in force are out of date. Dr. Reid points out that it is most desirable that by-laws in accordance with modern ideas should be in force in every district. Generally, the report is a record of steady work carried out on sound lines.

* * *

Housing at Greenock.

The report of the commissioners appointed by the Scottish Local Government Board to inquire into alleged unsatisfactory housing conditions in Greenock is of more than local interest, inasmuch as it affords some indication as to the official view of the functions of a local authority as purveyor of housing accommodation in the absence of private enterprise. The inquiry had its origin in a complaint by certain householders to the effect that there was a deficiency of housing accommodation, that many existing houses were insanitary, and that the corporation had not adequately carried out their duties under either part of the Housing, Town Planning, &c., Act, 1909. The commissioners were of opinion that the existence of a great number of insanitary properties was proved conclusively, and for this the report blames the owners, who do not sufficiently realise their responsibility in owning and letting uninhabitable dwellings. In dealing with the duty of the corporation on the failure of private enterprise, the report points out that the prevailing circumstances are peculiar, inasmuch as during the past three or four years there has been a boom in general trade in the borough, coupled with the influx of many workmen to the torpedo factory. To meet this influx employers of labour have done practically nothing, and even the Admiralty have not undertaken any scheme for housing their own employees.

It is a generally accepted fact that the provision of the better-class houses can be made upon an economic basis with reasonable certainty, and the commissioners do not think it is a good policy for the corporation to acquire the habit of providing, and to be expected to provide, for the very poorest class at uneconomic rents. That course would leave the better-class tenants for the benefit of private enterprise, and it would have the effect of subsidising wages or creating charity rents. There is a reasonable likelihood of a permanence of the improved trade conditions of the burgh, and the commissioners are of opinion that it will be a prudent thing for the corporation to proceed at once with the erection of 250 houses in addition to the 41 which are practically completed. It is not thought that these houses will entirely solve the problem; but the corporation should be permitted a certain time in which to stimulate private enterprise by the preparation of a town planning scheme which would prescribe such provisions as had been outlined and would appear acceptable to all parties concerned. If, after all these facilities have been provided, private enterprise is not attracted at an early date, the corporation should be required to undertake the erection of 250 additional houses. The corporation have indicated their desire to meet the situation, and the commissioners state that they have confidence that that they will do so.

* * *

Electricity Supply Problems.

The new president of the Institution of Electrical Engineers, Sir John Snell, has had such a wide and varied experience of his profession that an inaugural address of special interest was anticipated. This expectation was amply fulfilled in an utterance which dealt with the relation of the institution to technical education and to the commercial side of the industry, and discussed at some length important questions regarding bulk supply and the requirements of the domestic consumer. In recent years it has been recognised more and more in various fields of municipal enterprise that substantial economies may be effected by co-operation between neighbouring authorities, and Sir John Snell pointed out that the supply of electricity forms no exception to the rule. Indeed, he definitely laid down as a general proposition that a new local area about to instal an electrical system would do well first to obtain terms from a bulk supply authority. Better still, in many cases, while the local authority may find the capital to build its local sub-stations and to lay its distributing network at cheaper rates of interest than a bulk authority can raise money, expenses can be reduced to a minimum by arranging for all the administrative work and upkeep of the local system to be undertaken under proper supervision by the bulk authority. The Local Government Board can do much in this direction, but each case must

be considered on its merits. The main object is to enable the public systems to supply consumers on the most favourable terms. A further interesting suggestion made in the course of the address was that the Local Government Board should undertake a complete survey of the present position of all electrical authorities, so that they may be in possession of the necessary information to enable them to deal properly with applications for loans in cases where it appears that amalgamation of electrical interests or purchase of energy from some outside source for local distribution ought to be adopted. References to modern developments in current generation and to the rival claims of the overhead high-pressure system and the third rail in railway electrification completed an address of more than usual interest.

* *

The Engineer and Malaria.

Mr. F. D. Evans, Assoc.M.Inst.C.E., executive engineer, Public Works Department, Federated Malay States, discoursed on this topic at a recent meeting of the Junior Institution of Engineers. As is well known, the definite association of the mosquito with malaria was discovered by Sir Ronald Ross, then of the Indian Medical Service—in 1897, and has been conclusively proved by many workers since that date. All attempts to transmit malaria in any other natural way have failed, and the radical measure to prevent malaria is obviously mosquito destruction. The mosquito is a water-breeding insect, and Mr. Evans explained that anopheles mosquitoes generally breed in shallow pools and swamps, but that other species which have been shown to transmit other diseases, such as yellow fever, commonly breed in stagnant water, especially in the collections of water in tins, refuse and water holding receptacles, always to be found near habitations. The most certain way of getting rid of mosquitoes is to do away with all water containing refuse in vessels, or properly to screen in or close in such vessels, and thoroughly drain the land. As an alternative to thorough drainage the oiling of pools by covering with a thin film, and the poisoning of pools with a lardacide have been extensively tried, but these methods require extraordinary care and frequent application to be successful. In the Federated Malay States drainage has proved the most economical, suitable and permanent anti-malarial measure. There is not much doubt that in many countries, as pointed out by Mr. Evans, an essential to the success of an anti-malarial campaign is that the operations should be under the control of a single central authority. Under any circumstances, it will be agreed that it is most necessary for engineers carefully to consider the probable effects of malaria on the labour force to be employed on any new work in a malarious country, and to adopt what precautionary measures are practicable, in order to guard against the possibility of being faced with an appalling death and wastage rate when the work is in progress.

* * *

North-West Durham's Water Supply.

The Durham County Council are to be congratulated upon the measures they propose to adopt with respect to the water supply of the north-west part of the county. This area is supplied by the Weardale and Consett Water Company, under, presumably, the customary statutory powers; but it would appear that the company are in the habit of fulfilling their duty in a manner which, however satisfactory it may appear to them, is highly unsatisfactory to the inhabitants. Things are, in fact, if we are to credit a report on the subject by the Health Committee of the Durham County Council, in "a very serious" state. The chairman of the council, Sir Frank Brown, did not hesitate to describe them as a scandal, while Councillor Lawson made allusion to "the serious results of recent experiences arising from the company's failure to give a sufficient supply of water," the inference to be drawn from which is fairly obvious. In a resolution which he moved Councillor Lawson affirmed that the time had arrived when the local authorities, under a Joint Water Board, should own and control the water supply, and requested the Local Government Board to co-operate with the local authorities in obtaining the necessary powers for that purpose. The meeting was quite prepared to pass this proposition, but it was considered desirable to refer the subject to the Health Committee, who have decided to ask the Local Government Board to hold an inquiry "with a view to expediting any steps which ought to be taken for the provision of an adequate supply for the area in question." It is evident from what was stated that the water company have hitherto been treated with undue leniency, considering how greatly they have been in default, and it is to be trusted that the Local Government Board will act with promptitude in helping the Durham County Council to find the only possible remedy—viz., the control of the water supply of the area by a local authority.

* *

The Cole Testimonial.

Having regard to the long and devoted services rendered to the Institution of Municipal and County Engineers by Mr. Thomas Cole as secretary to that body, it was only natural that the council should have decided to mark his retirement from office by some tangible recognition of the esteem and regard in which he is held. In announcing their decision some time ago we expressed the opinion that they were acting in accordance with the general wish in fixing the limits of subscriptions to the testimonial fund at such a sum as to make it possible for every member to take part. The response has been good, but there are still many members who have not contributed, and as it is proposed to close the fund in time to publish the list of subscribers next month, it is necessary that those who desire to subscribe and have not yet done so should act quickly. The president has issued a circular letter pointing this out, and we agree with him in the view that it only needs such a reminder to bring in the remainder of the contributions before the appeal closes. From our knowledge of Mr. Cole we have full confidence in saying that the measure of his appreciation will not be the intrinsic value of the gift, but the knowledge that it comes as a spontaneous expression of the appreciation of the general body of the members of the great work which he has done for the institution which he loved and served so well.

* *

2nd London Sanitary Company.

We learn from Captain Arthur J. Martin that authority has now been given for the formation of a second Home Service Sanitary Company of the 2nd London Division Territorial Force. Thanks to the splendid response to Captain Martin's appeal for recruits for the 2nd (Res.) London Sanitary Company, he has not only filled the ranks of that company, but has on his waiting list the names of nearly enough well qualified men to fill up the new company. Applicants for the few remaining vacancies, who should be between the ages of seventeen and thirty-five, and should possess good sanitary experience, should communicate at once with Captain Cave, O.C. Depot, 2nd London Sanitary Company, Duke of York's Headquarters, Chelsea, S.W. The new company is being formed primarily for home service, but men will be transferred to the Imperial Service unit as opportunities arise.

The Complete Bacterial Treatment of Sewage without Filters.

By W. NAYLOR, [illegible].

A paper [illegible] experiments on the [illegible] of Sewage without the Aid of Filters [illegible] read before a meeting of the Manchester Section of the Society of Chemical Industry on April last by Messrs. [illegible] and W. T. Lockett, [illegible].

The paper consists of the following [illegible]. It has been found [illegible] to expose to the air [illegible] of the organic [illegible] with the formation of a deposit of [illegible] and the final production of [illegible] from the [illegible] and the [illegible] inorganic matter.

[illegible] the authors [illegible] it [illegible] in a Chemical Society, according to [illegible] what [illegible] that [illegible] the [illegible] indeed the experiments dealt with conditions specially active bacterially.

[illegible] a brief summary of the work of earlier investigators in the subject, the authors give in detail the particulars of their experiments which deal with the treatment of raw sewage by means of activated sludge, a treatment which point to even in its early stages, of considerable interest to municipal engineers, and to all engineers engaged in the design and construction of sewage works; for not only is the elimination of bacterial filters from sewage works in the future adumbrated, but also the introduction of cellular tank apparatus and point of the way of aeration [illegible] and sludge-handling appliances.

For the purpose of obtaining this activated sludge [illegible] were placed in bottles [illegible] of 2 quarts, aeration being effected in the [illegible] a laboratory filter pump. In the first [illegible] was continued for a period of five [illegible], and at the expiration of that time complete oxidation and nitrification had been obtained.

The clear supernatant liquid having been withdrawn, the remained activated sludge was introduced [illegible] sample of sewage and the operation repeated several times, the amount of such sludge gradually increasing and the time required for complete nitrification gradually decreasing, so long as the sewage was maintained slightly alkaline, the [illegible] a necessary condition.

When a sufficient quantity of sludge had been collected for the purposes of experiment, aeration of Manchester sewage in contact with it under varying [illegible] was observed, and one of the first points submitted to examination was whether it was desirable or necessary that the activated sludge be merely in contact with the sewage without intimate mixture of sewage and sludge, or whether there should be [illegible] mixture.

From an engineering point of view this is of great importance, for, while it is often a very small matter in a laboratory to arrange or rig up a very effective mixing or stirring apparatus for dealing with a pint or so of liquid and sludge, to bring about the same result on a large scale when dealing with hundreds of tons or millions of gallons involves extra tanks, pumps, engines and special machinery.

Two experiments were made with respect to mere contact *v.* intimate mixture (1 volume of activated sludge to 25 volumes of sewage), the samples of clear sewage being numbered, the one 7a, and the other 8a. A portion of each, denoted A, was used for contact without intimate mixture, and a portion B for intimate mixture, and the character of each portion is shown by the following figures:—

	7a		8a	
	A	B	A	B
Oxygen absorbed 4 hours ...	3·88	4·96	5·20	5·31
Precipitation ...	2·71	2·71	2·43	2·56
Albuminoid ammonia	·33	·33	·17	·185
Nitrates and nitrites as ammonia ...	—	—	·07	·07

Presumably, these samples 7a and 8a were merely variant samples of the outfall discharge, and as the effect of the treatment upon them was pretty much the same in both cases relatively, the actual figures for one only—8a—need be adduced and considered in detail. In this case the oxygen absorbed was reduced in both cases, A and B, to 2·90 after four hours' aëration. It was then continued until twenty-four hours [illegible] expected, when the [illegible] ligure in A [illegible] and in B 1·28, [illegible] certainly [illegible] of [illegible].

The free ammonia had increased practically in both A and B after four hours' aëration, but after [illegible] hours it was 2·28 in A and 1·22 in B.

Albuminoid ammonia was reduced in both A and B by practically the same amount during the first four hours—viz., to ·30 in A and ·29 in B; but after [illegible] the figure for the former was ·215 and for the latter ·10, an exceedingly striking result.

The increase in nitrates followed on the same lines as the reductions in objectionable high figures, being ·17 for both after four hours, while after twenty-four hours it was ·86 in B, but only ·07 in A.

It will be seen, therefore, that satisfactory effluents were obtained (and for the present purpose we may accept as satisfactory an effluent yielding albuminoid ammonia below ·15 per 100,000, absorbing oxygen in four hours below 1·5 per 100,000, and showing unmistakable signs of nitrification in progress) where there was intimate mixture of sewage and sludge combined with aëration during a period of twenty-four hours. This period of twenty-four hours, however, was presumably regarded by the authors as outside the region of practical working, for the next series of experiments were conducted over a shortened period of time, but with a much greater quantity of sludge proportionately.

These dealt with varying proportions of activated sludge to sewage, and compared also the effect of "side by side" aëration in parallel samples of sewage in the *absence* of activated sludge. In the latter cases the samples of sewage were diluted with water to the extent of about 20 per cent, that being about the equivalent dilution due to the water introduced by the activated sludge in the cases where it was used.

Analytical figures are given in full detail, but the effect of the treatment can be well observed by following the condensed table which quotes only those for oxygen absorbed, albuminoid ammonia, and nitrates. By reading the table downwards vertically the effect of aëration may be readily observed, the outstanding feature being that with a volume of sludge to sewage as 1 to 4, and six hours' aëration, a fairly good effluent is obtained.

It will probably have been observed already that in all the results given on opposite page the oxygen absorbed figure is reduced during the process of aëration much more quickly than the figure for albuminoid ammonia, that is to say, the oxidation of the carbonaceous, putrescible matter (in the presence of suitable organisms) proceeds much more quickly than the nitrification of ammonium compounds during the period of aëration.

Since these two processes are the separate work of distinctive organisms, it probably occurred to the authors that a separation of both organisms and processes might be attempted, for the next portion of the paper concerns itself with the fact that in the process there is a rapid initial effect on the oxidisable matter, a well clarified effluent being obtained within a period of about three hours (even where the proportion of activated sludge is low), the latter stages being confined to the nitrification of ammonium compounds as would be expected from published results of workers in the past.

Attempts were made to sectionise or separate the process into two parts—(*a*) a carbonaceous formation, (*b*) a nitrification of ammonium compounds.

With this object in view, parallel samples of raw sewage were treated with only partially activated sludge first, for a period of two hours, and afterwards for a further period of two hours with ordinary activated sludge, and the effects compared with the same raw sewage which had been treated for four hours with thoroughly activated sludge which had been proved capable of thoroughly promoting nitrification.

This method of operation was repeated as often as was reasonably practicable within the twenty-four hours, with the result that the partially activated sludge and nitrifying sludge (in two operations) dealt

with [illegible] ing the *effects* only, for in none of the cases is the oxygen absorbed figure brought below 2·00, while the [illegible] On this point, however, it is reported: "Unfortunately, during the course of this series of experiments low temperatures were experienced, not only with the sewage dealt with, but in the laboratory, owing to trouble with the heating apparatus. . . . It was impossible to say to what extent, if any, either of these two factors influenced the results obtained, and instead of continuing sectionised experiments on these lines attention was diverted to the study of the question involved. Before leaving this part of the subject it may be stated that while the above experiment failed to determine the possibilities of sectionising the oxidation process the matter has not been lost sight of, and it is the intention of the authors to return to this question at an early date."

On the whole, the experiments must be regarded as [illegible] may be advanced that they are only "bottle" experiments, it must also be remembered that the day has gone when engineers ignore a laboratory experiment at sight, simply because it *is* a laboratory experiment. Cheaper materials, easier methods of handling, mixing, and lifting, quicker and more effectual methods of separation, filtration, conveyance, heating, cooling, and so forth, have rendered it customary now for engineers to look more closely at the actual facts demonstrated by the experiment rather than anything else.

[illegible] it up in shallow lagoons over large areas for considerable periods of time. It was observed, however, even then, by the expert witnesses that the sewage which had been ponded up for some considerable time in very shallow lagoons attained a remarkable degree of purity, a high content of nitric nitrogen, and that the ponds also developed a fine growth of algæ.

On a smaller scale similar conditions have prevailed from time to time on the sewage farms of the Wigan and Bolton Corporations during the past twenty years, to say nothing of the work in earlier papers on "The Self-purification of Rivers" by Tidy.

The objects of the present experiments are obviously to discover whether the above slow operations can be artificially accelerated and conducted by such means and by such plant as will compete favourably with bacterial filters. Before this is settled much water will have to pass under the bridges, and either to speculate on revolutions or to parade imaginary difficulties would be alike improper.

At the same time, certain prominent facts thrust themselves upon one's notice. One volume of sludge to 4 volumes of sewage, or 1 volume in 5, is a pretty solid affair to have to deal with, since the sludge from precipitation methods is only produced at the rate [illegible] in 110, and for the settlement of the latter satisfactorily a six hours' period of quiescence is necessary, where continuous flow is not in vogue.

Results expressed in parts per 100,000

		[illegible]	Albuminoid [illegible]	[illegible]
Experiment 22	Settled sewage [illegible]	7·[illegible]	·[illegible]	Nil.
	" " after [illegible] hours aeration	6·57	·115	Nil.
	" " 12 "	[illegible]	[illegible]	[illegible]
	Raw sewage and sludge 1 vol. of sludge to 4 vols. sewage	[illegible]	·[illegible]	[illegible]
	" " after [illegible] hours aeration	[illegible]	·16	[illegible]
	" " " 12 "	[illegible]	·13	[illegible]
Experiment 25	Settled raw sewage alone	6·97	·[illegible]	
	" " after [illegible] hours aeration	5·[illegible]	·[illegible]	
	" " 12 "	4·91	·[illegible]	
	Raw sewage and sludge 1 vol. of sludge to 4 vols. sewage	[illegible]	·[illegible]	
	" " after 6 hours aeration	[illegible]	·[illegible]	
	" " " 12 "	1·[illegible]	·[illegible]	[illegible]
Experiment 81	Settled sewage and sludge 1 vol. of sludge to 4 vols. sewage	9·10	·[illegible]	
	" " after 3 hours aeration	2·[illegible]	·18	
	" " " 6 "	1·7	·105	·[illegible]2
	" " " 9 "	1·20	·08	·[illegible]2
Experiment 82	Settled sewage and sludge 1 vol. of sludge to 4 vols. sewage	[illegible]	·[illegible]2	–
	" " after 3 hours aeration	2·97	·[illegible]05	·[illegible]
	" " " 6 "	1·[illegible]	·10	·34
	" " " 9 "	1·12	·08	·81
Experiment 83	Settled sewage and sludge 1 vol. of sludge to 4 vols. sewage	[illegible]	1·[illegible]	
	" " after [illegible] hours aeration	2·17	·22	·04
	" " " 6 "	1·[illegible]	·115	[illegible]
	" " " 9 "	1·[illegible]	·105	[illegible]

The satisfactory settlement of such a tremendous increase in sludge will necessitate increases in tank [illegible] though probably not by any means in [illegible] tion to the difference in the ratios of sewage and sludge. The time occupied in filling and drawing off would also be such a serious matter that continuous flow will be probably aimed at. Here again, however, settlement cannot be expected while aëration and intimate contact are being actively prosecuted; hence additional tank space for settlement on the continuous-flow system would be demanded, due to the increase in the burden of suspended sludge.

Temperatures are also evidently matters of importance. It is reported that the purification effected is seriously diminished at temperatures constantly below 10 deg. Cent. Up to 20 deg.—24 deg. Cent. no material difference in the clarification effect and general purification has been observed, although the nitrification change proceeds more rapidly as the temperature rises. At higher temperatures the clarification effect is somewhat interfered with during the earlier period of aëration with a consequent delay in the establishment of nitrification. Subsequently, the rate of nitrification somewhat increases.

The maintenance of the activity of the sludge is also a matter to which Messrs. Ardern and Lockett gave due attention.

Naturally, the question would arise as to the possi-

Of course, the main fact of the successful purification of sewage by means of aëration without filters may not be altogether new. The writer well recollects a case where it was roughly "blundered" on. About the year 1896 a joint action was entered in Court against the Preston Corporation by landowners and a neighbouring local authority, praying that the corporation should be injoined from causing a nuisance to the district by alleged smells from the sewage farm.

In making the necessary qualifying inspections as a witness in the action the position was found to be roughly as follows:—

The farm had an area of about 600 acres, and was called upon to deal with about 3,000,000 gallons of sewage per diem—a sewage not by any means fresh. As in most cases of old towns, some of the sewers were of good age, and, moreover, the temperature [illegible] tenant, and the method of treatment practically broad irrigation, for any attempts at preliminary settlement or precipitation were at that time crude.

Naturally, the tenant paid his rent with a view [illegible]

section 1 of the process (oxidation apart from nitrification) maintaining its activity under these conditions, and the experiments made in this connection deserve careful notice.

Four equal volumes of proved activated sludge were placed in separate bottles, A, B, C, D, each containing [illegible] the sample, it may be safely assumed, though this is not specifically stated.

Taking D first, this was submitted to a process [illegible] settlement, and subsequent removal of purified [illegible] three times during the twenty-four hours. The results gradually deteriorated with the total inhibition of nitrification, but the behaviour of C suggests that such deterioration would not occur if the saline and free ammonia present in the remnant sludge after the draining off of supernatant liquor were previously oxidised to nitrates by the aëration of residual sludge only.

[illegible] purified effluent removed. Sludge was then aërated for remainder of day. In this case good results were maintained—where efficient aëration was insured.

The samples in A and B were subjected to much longer periods, but evidently only with a view to comparisons beside D and C, the results being interesting in themselves though not requiring further notice here.

But the necessity for the further aëration of sludge alone again introduces "time and money," and renders it pretty plain that bacterial filters are not to [illegible] gotten, however, that bacterial filters are not by any means self-maintaining. Cases of silting up, and even of frequent washing, are met with—matters of no small expense.

With aëration tanks, followed by any necessary final settlement arrangements, the ever-appearing difficulty as to fall of land for hydrostatic head on filters would be eliminated, as well as the trouble frequently arising from "revolving" sprinklers which refuse to revolve.

The question of aëration is comparatively simple, no great air pressure being required; indeed, the system of aërating liquids as a means of bringing about intimate admixture with sludge was introduced by Messrs. Mather & Platt over twenty years ago, both in processes of water softening and the treatment of trades waste. But in the case of sewages the "making up" of aëration pipes by silt and road detritus would have to be guarded against, and no less a question is that of the "exit air" after its passage through sewage, charged, as it may be at times, with offensive gases.

Should this air have to be passed through some sort of incinerating plant, the cost is further increased. That in the neighbourhood of percolating beds is frequently anything but pleasant, due merely to emanations only from the sewage, not to its having been forced through the sewage.

So far as the "sludge disposal" question is concerned, if anything, the process should bring about an improvement from two points of view. This material should be less disagreeable to handle, owing to its non-putrescent character, and for the same reason it should be less slimy, and therefore more easily pressed.

The results of the further experiments will be awaited with interest by all engineers, but tank experiments on a practical scale are necessary at this stage, particularly with reference to the "sectionising" portion of the process—apparently its most promising feature. Satisfactory work in this direction might easily result in the design of percolating filters used in pairs and working at different rates, the quicker rate and smaller area for carbonaceous oxidisation only, the slower rate and larger area for nitrification only.

Bayard Cars. We have received from Bayard Cars Limited, 155-157 Great Portland-street, London, W., copies of a number of unsolicited testimonials sent during the present year by owners of Bayard cars. All serve to show how much the purchaser of a car appreciates a vehicle that gives him good service.

THE REMOVAL OF CARBONIC ACID GAS AND IRON FROM WATER SUPPLIES.

At a local Government Board sanitary inquiry held by Mr. A. W. Brightman, M.Inst.C.E., Government inspector, to inquire into an application of the Carmarthen Corporation to borrow £1,400 for purposes of water supply, at Llandovery, evidence of the difficulties experienced in connection with the [illegible] was given by Mr. A. E. Adams, the borough surveyor.

Mr. Adams said that the town was supplied with water from a natural artesian well, and that there had been for a long time great complaints as to the quality of the well water, the principal trouble being the dissolved iron and carbonic acid in the water. The amount (2·1 grains per gallon) of carbonic acid gas found in the well water was four times greater than that present in a normal water, the amount of iron present was 0·2 grains per gallon. As it had become apparent that steps must be taken to remove the iron and carbonic acid if the water was to be made palatable for the consumers, it was decided to instal a Candy automatic compressed air and oxidising filter on the low-level service in conjunction with a de-carbonator at the reservoir. The result of the treatment was that the iron in the water was reduced to a mere trace, and the carbonic acid to 0·61 grains per gallon, which is about that of a normal water. Carbonic acid gas when combined with oxygen had a very solvent action on wrought-iron pipes, and the excess of carbonic acid had for this reason previously caused the town much trouble. The Candy oxidising filter proved so exceedingly successful in improving the water on the low-level service that the corporation installed another Candy filter on the high-level service, with equally satisfactory results, the borough analyst reporting as follows: "The water after filtration and aëration is bright and clear, well aërated and practically free from iron, and the carbonic acid has been reduced to that of a normal tap water."

The inspector, among other questions, asked as to the amount of pressure necessary to force the water through the filters, to which the surveyor replied that he was pleased to find it so small; at the end of a week's working (which was as often as it was found necessary to clean the filters) the pressure on the inlet was only about 3 lb. more than on the outlet.

The inspector remarked that the fact of the Candy filters having been tried and proved so satisfactory was the best recommendation.

The surveyor explained that he was particularly desirous, before recommending a permanent scheme to his council, to test these filters under the arrangements made whereby, if the results had been unsatisfactory to them, the council would only have had to pay for the hire, and could return the filters to the makers.

The inspector: I do not know whether the medical officer of health wishes to make any remarks?

Dr. Briscoe: I think the installation of these Candy filters will be a great advantage to the town, and will contribute very much to the general use of the water, especially in the rural districts which will soon be brought into the borough.

The inspector: You are satisfied with the results obtained?

Dr. Briscoe: I am.

The inquiry then closed, and the inspector proceeded to view the waterworks.

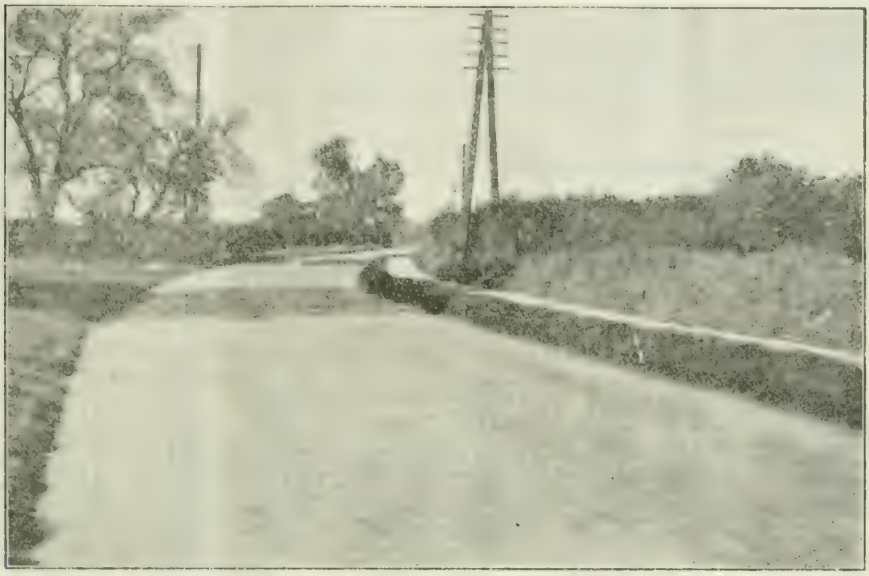
Kingston Bridge Improvement. Kingston Bridge, which connects the Surrey shore of the Thames with that of Middlesex, has been widened by 30 ft., the extension being now open to the public. The original bridge had a width of 25 ft. only. Now there is a carriageway 35 ft. wide, and a footway 10 ft. wide on either side.

Challenge to a Road Surveyor.—At a meeting of the Carmarthenshire Main Roads and Bridges Committee recently some amusement was caused by the statement of Mr. Peel, a member, that a gentleman had come to the meeting to challenge Mr. Gomer Henry, the surveyor, to drive a horse and trap over the Llandilo—Llandovery road without tumbling, and had offered to give £5 to the Prince of Wales' Fund if the surveyor succeeded. The two surveyors were instructed to submit a report as to the slippery state of the roads in the county.

SLAG TAR-MACADAM ROADS.

By John Robinson,
Surveyor to the Darlington Rural District Council.

During the past seven years I have laid many miles of slag tar-macadam roads for the Darlington Rural District Council. My first specification for carrying out the class of work was to use 2½-in. bottom course and 1½-in. finishing coating, with a very thin sprinkling of clean ¼-in. untarred slag, the result being that, although the road appeared to be rather open for the first few months after being laid, it eventually faced up to have the appearance of a mosaic pavement. I found, however, that I could get equally as good results and a road more suitable for the traffic of a rural district by putting down the road with material consisting of 70 per cent of 2½-in. and 30 per cent of 1½-in. mixed together and laid in one coat. In my opinion a great mistake made by road surveyors in laying a tarred slag road is the use of a fine tarred topping material. Almost



Length of Tar-macadam Laid in 1910 on the Main Road between Croft and Darlington.

Length of Tar-macadam Laid through Aycliffe Village on the Darlington to Newcastle Main Road, in 1910.

[illegible] confidence in his material when applying it, and I have found from experience that roads laid in accordance with [illegible] more evenly than those finished with any fine tarred topping.

If [illegible] Darlington and north of Darlington through Aycliffe Village [illegible] laid for a period of six years) they would be able to satisfy themselves as to my contention.

WAKEFIELD WORKMEN'S DWELLINGS.

GENERAL SUMMARY OF SCHEMES.

[illegible] men's dwellings at Belle Vue and Alverthorpe, Wakefield—which have received the approval of the Local Government Board—has been prepared by the city surveyor, Mr. J. P. Wakefield, M.INST.C.E.

[illegible]

	72 Houses, Belle Vue			36 Houses, Alverthorpe.		
Type	A	B	E	E	E	H
Frontage	14 ft. 9 in.	18 ft.	17 ft. 6 in.	26 ft.	12 ft. 9 in.	12 ft. 9 in.
Number of bedrooms	[illegible]	4	3	3	2	1
Size of bedrooms	[illegible]	[illegible]	[illegible]	13 ft. 9 in. × 8 ft. 9 in.	12 ft. × 12 ft.	12 ft. × 12 ft.
Size of living-room ...	14 ft. × [illegible] ft.	14 ft. × 12 ft. 11 in.	13 ft. 7 in. × 12 ft. 6 in.	13 ft. 3 in. × 14 ft.	12 ft × 12 ft.	12 ft. × 12 ft.
Scullery ...	[illegible]	[illegible]	12 ft. × 9 ft. 6 in.	11 ft. 9 in. × 9 ft.	12 ft. × 7 ft. 6 in.	7 ft. × 6 ft. 6 in.
Estimated Costs.						
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Houses and land ...	181 7 1	202 1 5	242 [illegible]	214 8 2	166 7 0	130 10 1
Street works and drains ...	17 [illegible]	20 4 11	22 [illegible]	12 [illegible] 6	11 6 11	10 2 5
Total ...	198 15 1	222 [illegible] 4	264 [illegible]	226 11 8	177 13 11	140 12 6
Suggested Weekly Rentals.						
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Rent ...	3 10½	4 1½	5 1½	5 0	3 10	3 1
Rates and taxes ...	1 10½	2 1½	2 5	2 6	1 9	1 5
Total ...	5 [illegible]	[illegible]	7 7	7 6	5 7	4 6

Each house, both at Belle Vue and Alverthorpe, is self-contained, having a separate water-closet, coal-place, copper and garden (front and rear) divided off by footpaths and fences.

The Belle Vue houses, including garden (front and rear), occupy an average area of 136 sq. yds. per house (exclusive of street areas), and average 14·17 houses to the acre (inclusive of allotment and street areas). A large playground for children and nineteen allotments are provided at Belle Vue, and the cost of these is divided proportionately, and included in the estimated total cost per house given above; but it is anticipated that each allotment will let at 10s. per annum.

The Alverthorpe houses average 17·34 houses per acre (inclusive of street areas). No children's playground has been provided, since there is a public pleasure ground already in the vicinity; but each house has a garden (both front and rear), and the average area occupied by each house (including gardens) is about 165 sq. yds.

A Municipal Picture-house.—Kirkintilloch has added to its municipal undertakings a picture show. The profits go to the common good of the burgh.

Municipal Engineering Students' Visit.—On Tuesday last Prof. Matthews, of University College, London, following up his recent public lecture on "Refuse Disposal," took his municipal engineering students to the Wood Green refuse destructor and public baths, which they were enabled to inspect by the courtesy of the council's engineer, Mr. C. H. Croxford. Mr. Croxford, who was accompanied by his assistant and the works manager, spared no pains in supplying information to the party, who on departing expressed [illegible]

PRO PATRIA.

[ELEVENTH LIST.]

We present herewith the eleventh list of municipal engineers and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Adams, W., sewage works employee, Corporation of Leeds, private, West Yorks.

Ainley, E. E., inspector of works, sewerage engineer's department, Corporation of Leeds, 2nd Lieutenant, 6th West Yorks.

Atkinson, S., draughtsman, sewerage engineer's department, Corporation of Leeds, private, 9th West Yorks.

Beach, A., junior in resident engineer's office, sewerage engineer's department, Corporation of Leeds, bugler, 9th West Yorks.

Beecroft, C., office chairman, sewerage engineer's department, Corporation of Leeds, bugler sergeant, 8th West Yorks.

Bradley, H., Chairman in resident engineer's office, sewerage engineer's department, Corporation of Leeds, driver (Reservist), Royal Field Artillery.

Green, A. E., inspector of works, sewerage engineer's department, Corporation of Leeds, 2nd Lieutenant, 6th West Yorks.

Hainsworth, F. J., clerk, sewerage engineer's department, Corporation of Leeds, private, 7th West Yorks.

Lucas, J. O., improver, sewerage engineer's department, Corporation of Leeds, private, Royal Garrison Artillery.

Marriott, J. H., engineering assistant, sewerage engineer's department, Corporation of Leeds, private, Royal Army Medical Corps.

Moir, L. R., engineering assistant, sewerage engineer's department, Corporation of Leeds, private, Royal Army Medical Corps.

Silcock, E. H., inspector of works, sewerage engineer's department, Corporation of Leeds, 2nd Lieutenant, 6th West Yorks.

Spedding, A. E., correspondence and shorthand clerk, sewerage engineer's department, Corporation of Leeds, private, Royal Army Medical Corps.

Waller, A. J., loco. driver at sewage works, Corporation of Leeds, bombardier (Reservist), Royal Field Artillery.

Ward, J. L., sewage works employee, Corporation of Leeds, private, York and Lancaster.

Wilson, A. W., inspector of works, sewerage engineer's department, Corporation of Leeds, 2nd Lieutenant, 6th West Yorks.

The council of the Surveyors' Institution are desirous of preparing a Roll of Honour, comprising the names of all members who are engaged in military service, either in the Regular or Territorial Army. In order to enable this record to be correctly drawn up, members are desired to forward the requisite information to the Secretary, 12 Great George-street, Westminster, S.W.

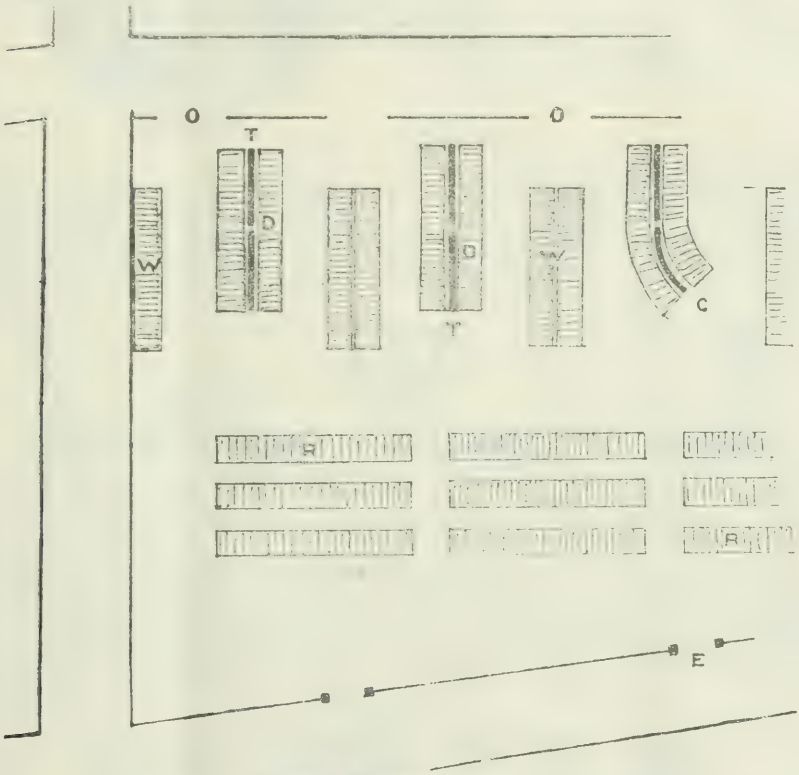
Camp Sanitation.

(5.) WATER.

By G. BERTRAM HARTFREE, [illegible], Engineer and Surveyor to the Alton, Hants, Urban District Council.

An allowance of 20 gallons per day per man is here assumed as the standard for barracks. In temporary camps the following is taken as a reasonable per diem: Men—drinking, ½ gallon; cooking, 1 gallon; washing, 3 gallons; horses—drinking, 8 gallons; watering, 2 gallons.

For troops on the march it is essential that the water engineer shall supply water with the least avoidable delay. In the absence of previous arrangements with the military authorities, it is suggested that an assistant engineer or some other competent person should be stationed at the watering post nearest the oncoming troops to give full but concise directions.



Horses' Watering Ground

An infantry battalion of full strength marching four abreast, and at the rate of 3 miles per hour, would pass a given point in three minutes, and, allowing two water-carts per battalion, these would arrive at the rate of 1½ minutes apart; but, providing for transport and distances between battalions, the average rate of arrival of water-carts may be three minutes.

To prevent delay the engineer should be prepared as to the capacities of his watering posts. I have recently tested several which had a head of 100 ft., and which, according to recognised formulæ, should deliver at a velocity of 80 ft. per second, $V = \sqrt{2gh} = 8{\cdot}025\sqrt{H} = 80{\cdot}25$. Taking the delivering capacity of a pipe 2 in. internal diameter as $\frac{2^2}{4} \times \frac{\pi}{2} \times 6{\cdot}25$, or ·137 gallon per foot in velocity, these would deliver 10·960 gallons per second. As a matter of fact, I obtained but 1·1 gallon in that time; but as the greater time is taken in getting the cart in position and turning on the water, calculations as to the pressure in mains do not appear to be imperative. However, should a standard be required, my experiments show that for standpipes 2 in. internal diameter the gallons delivered per second are approximate to one-ninth the square root of the head in feet.

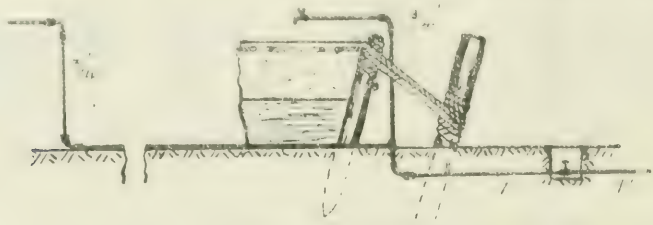
From a number of trials I am of the opinion that a water-cart containing 110 gallons (army pattern) cannot be filled in less than four minutes, allowing for pulling up, adjusting fittings, &c., and turning on the water, as well as watering the horses drawing the cart, which should be done from buckets and while the cart is filling.

The assistant engineer in charge of water should therefore be prepared in respect to rate of arrival of water-carts and the capacities of his watering-posts, and give information on the following lines: No. 1 cart fill here; No. 2 cart fill at post on this road × yds. distant, indicated by white flag and marked No. 2; No. 3 cart at post on this road × yds. beyond No. 2, and indicated, &c. By the time the fourth cart arrives No. 1 should be filled ,and away; but it is desirable, if possible, to select other points as emergency stations.

The horses accompanying infantry may be watered from buckets, a supply of which should be obtained. For cavalry, artillery and horsed transports more extensive arrangements are required. Should the supply be from a public main, an open space, park or recreation ground ought to be prepared as a watering place. If the site is not provided with an entrance and exit, both easy of access, the fence must be removed and the bank levelled. Full arrangements are impera-

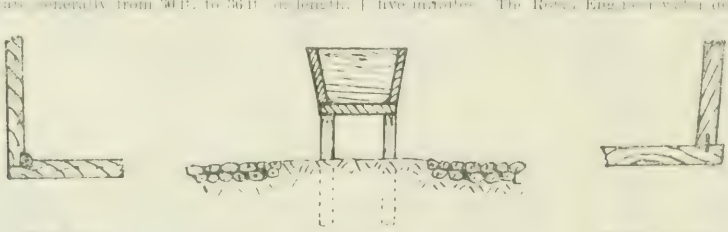
[illegible] from obstructing the [illegible] to others.

If the troughs are provided with canvas trenches these should [illegible] at least an hour in advance, and [illegible] be in charge of a [illegible] of Royal Engineers. Canvas troughs are supplied [illegible] pipe, or some modern form of coupling with [illegible] quicker erection. The brackets consist of a metal [illegible] Where canvas troughs are used [illegible] under those troughs nearest the main, and care must be taken that the brackets do not rest upon the pipe, but that the latter, while passing under the canvas, rests on the base of the bracket; otherwise the pipe stands great risk of being fractured.



Detail of Standpipes

Troughs may not abut or be near others, except end to end, and if possible a distance of 100 ft. is desirable between sides. The troughs provided by the Royal Engineers are generally from 30 ft. to 36 ft. in length.



Bush Joint — Wood Trough — Tonnel Joint

It may be found necessary to erect emergency standpipes, and the following will be found to be useful dimensions: Service pipe, 1 in. in diameter, and taken [illegible] at which height a bend or elbow is provided with a horizontal branch extending 18 in. with a bibcock at the end. A stopcock, under ground, is desirable, as the standpipes may be damaged, and the precaution will limit waste and facilitate repair.

Horses should have their bits loosened for watering, and care must be taken to prevent their stepping on [illegible]

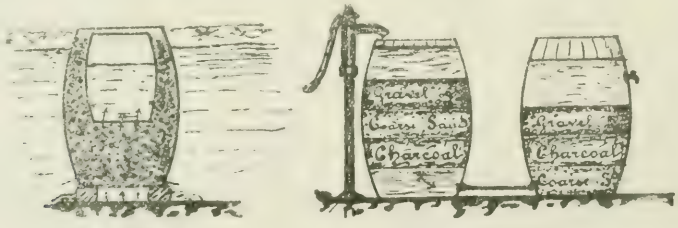
Should canvas be unobtainable, either trenches must be dug and lined with clay, or shallow metal tanks provided; or, if time permits, wood troughs should be constructed. In erecting wood troughs all abutting boards must be planed true (technically known as "shooting" the edges). Sounder joints are made either by tongueing and grooving or by rebating edges and inserting large rushes which swell and close all cracks. Glue is unsuitable for jointing [illegible] substitute if applied before the joint is made, and [illegible] may be used if the [illegible] is metallic [illegible] The patch is very effective if applied after the joint is made.

Sloping [illegible] should be built a portion of permanent pitchings is necessary for the horses to stand on.

Where supplies are taken [illegible] than from a water main, the following rules must be observed and carried out [illegible] drinking water [illegible] and camp drainage, if reaching stream, must enter as far down as possible.

In the event of the sole source of supply being a pond, especial care must be taken; whenever possible horses should drink from troughs into which the water has been pumped, and drinking direct from the stream or pond should be prevented.

The military water carts are fitted with two rotary pumps which are capable of filling them in thirty-five minutes. The Royal Engineers [illegible] are equipped with [illegible] pumps, but in the absence of these the water or municipal engineer may be required to bring his inventive powers into action, and probably will have in hand some form of contractor's pump, either steam or manual driven. In the absence of anything better, a fire engine could be [illegible] of portable pump, capable of delivering from [illegible] to 10,000 [illegible] per hour.

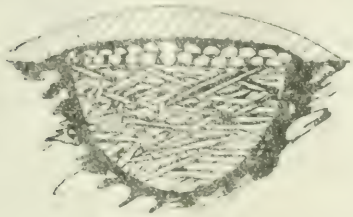


River Filter — Pump Filter.

In rural camps there is the possibility of an insufficient water supply, and a necessity of marking suspicious water as a reserve for boiling purposes and ablutions. In such cases it is desirable that every class of water should be clearly identified by distinguishing flags. The military generally use a white flag to denote men's drinking water, and one of blue colour for horses. When water is taken from a running stream red denotes an ablution station, [illegible] were this colour replaced by green, and red used to denote dangerous [illegible] supply.

[illegible] necessary, and medical opinion [illegible] limited; it is suggested that, should the familiar pink reaction not appear, the water should be allowed to [illegible] permanent tinge remains.

Emergency filters may be constructed out of barrels, tins, or anything at hand that will hold water. [illegible] barrel is very useful, as the clear water may be [illegible]



CHARCOAL PIT

the media contained in the latter. When the supply is from a pump two barrels of equal size are pre[illegible] up and [illegible] gravel and coarse sand are suitable media for filtration. A perforated iron plate is required to support the charcoal in No. 1 barrel of the pump filter, and fine meshing, or the coarse canvas known as "butter cloth" when used to separate the filtering material [illegible]

The burning of charcoal has been described in a previous chapter, and is illustrated herewith.

SOME RECENT PUBLICATIONS.*

REPORT OF THE SPECIAL COMMITTEE ON REINFORCED CONCRETE. (The Engineering Society of China.) Shanghai: Kelly & Walsh, Limited.

[illegible] the Engineering Society of China in December, [illegible] investigation undertaken by the committee is that it consisted largely of actual tests of materials, blocks, beams and slabs, instead of following the undesirable precedent set by some professional bodies in this country of merely collecting and collating information second-hand. Full particulars are given relative to the conduct and results of the tests, and the report concludes with appendices containing a copy of the British Standard Specification for Portland Cement, and analyses of the brands of cement used in the tests.

RAPID EARTHWORK CALCULATION. By C. E. Housden, late P.W.D., India. With diagrams. Price 1s. 6d. nett. London: Longmans, Green & Co.

This little book is intended for the use of engineers [illegible] earthwork in connection with railways and canals. The tables included in the book are designed to enable the calculations to be made with greater rapidity and less labour than in any other way, and the method adopted makes it easy for the progress of the work to be ascertained from time to time while it is being carried out. The book should certainly be of considerable use to engineers engaged in such work.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

During the time John Smeaton, of Eddystone Lighthouse fame, spent in London he was accustomed to [illegible] calling—canal makers, bridge builders, and others [illegible] generic term of "engineers." The place of meeting was the "Queen's Head Tavern" in Holborn; and after they had come together a few times the members declared themselves a society, and kept a [illegible] matters relating to their business being the object of their meetings. Some personal disagreement, however, occurring through the offensive behaviour of one of the members, Smeaton withdrew from the club, which came to an end in 1792. Is not this the earliest recorded instance of the formation of a society or association of civil engineers?

* * * *

Why is it that, while in the West Midland district of the Institution of Municipal and County Engineers it has been found possible to arrange meetings for every month up to and including April next, there is not a single fixture announced by any of the other districts?

* * * *

Is not the list of papers to be read at the forthcoming annual meeting of the Institution of Municipal Engineers, if not exactly of a formidable nature, an altogether excellent one; and is not the promised contribution of Mr. G. Belson Chilvers, "A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts," one that is likely to elicit a particularly full and free discussion? Will there not, however, be a feeling of regret among members that, owing to "the prevailing circumstances," it was not found possible to hold the meeting in the historic city in which the president-elect, Mr. Matthews Jones, has for so long filled the position of engineer to the corporation?

* * * *

How often in these days is good service recognised and rewarded as was that of a former assistant of the late Mr. William B. Bryan, chief engineer to the Metropolitan Water Board, who, it is related, only twelve months after taking up his appointment, besides being notified of his recommendation for a substantial increase of salary was handed a cheque for £100 as a [illegible] Mr. Bryan's personal appreciation of his work?

* * * *

In what manner is the housing question really going to be met in the future? Is it not evident that as wages increase the cost of building will be higher, and that either rentals will have to increase or State aid will have to be still further resorted to? What will be the ultimate result if local authorities continue to erect houses at prices which are not self-supporting, and how long will the ratepayer be content to work for and pay for the difference in rent of some of his "premiated" neighbours?

* * * *

W[illegible] the complaint of a rural councillor the other day that good roads are not of much advantage to ratepayers? Does not a good road encourage more and more traffic, and more expensive upkeep? Does it not encourage the motorist to speed along instead of proceeding quietly and perchance stopping for refreshment or the purchase of some trifle? What are the answers to these questions?

* * * *

Is not the conduct of public affairs very similar, after all, to the conduct of private life? Is it not really more important to consider what is the motif that induces an action rather than the result? Will not an upright and honest motif permanently strengthen the character of a nation or an individual? What citizen of the United Kingdom to-day does not envy the splendid, patriotic, brilliant, yet modest life of the great general who has just passed away at a ripe age? Was there not there a life full of the highest possible motives, though, alas! for this country, the action that should have followed the motive so strenuously impressed on us was never carried into effect, with the result that has been so disastrous to us?

REMODELLING A SEWAGE WORKS.

[illegible] sprinkling filters the sewage treatment plant at [illegible] to handle a daily [illegible]

[illegible] t chamber sewage entered an open brick [illegible] 75 ft. long, 25 ft. 6 in. wide, with an average depth of 1 ft. Two 20-in. brick walls divided it into four equal compartments arranged so that two, three [illegible] time.

Sewage Works Remodelling.

The contact bed was divided into four units, each 85 ft. by 42 ft. area, each enclosed by 16-in. brick walls. Three of the beds were filled to a depth of 4 ft. with slab ranging in size from ¾ in. to 1½ in.; the fourth bed was filled with cinders.

The work of remodelling consisted in removing the existing bottom and excavating to an additional depth of 2 ft. 4 in. As the new bottom was carried below [illegible] was built in the form of an arch to give the necessary stability to the walls, and to assist in the removal of the sludge. The outside walls were raised in height by 6 in., and the changes altogether increased the depth of the tank from 7 ft. to 9½ ft.

The remodelled tank consists of four units, each of which is again divided into three compartments by a false bottom constructed of 2-in. creosoted yellow pine. This false bottom makes a slope of 40 deg. with the vertical. The upper two compartments are settling compartments, and the lower and larger compartment is the sludge-digestion compartment. The total settling capacity amounts to a retention of 1·35 hours when the plant is operated at the rate of 500,000 gallons daily. The total capacity of the sludge-digestion chamber figured below the level of the walls is 5,470 cub. ft.—about 50 per cent larger than required by established practice, observes Mr. Alexander Potter in describing the work in *Engineering Record*. Three 6-in. sludge pipes extend down into the sludge-digestion chamber of each unit.

The cost of remodelling the contact beds into a sprinkling filter was somewhat more than was expected, as it was found that less than [illegible] could be used in the new filter.

Thames Conservancy Board.—The tender of Messrs. Cooper, Wettern & Co. has been accepted for paving for the wharf extension at Kingston (Surrey) at 8s. 10d. per super. yard, £464 in all; and that of Messrs. J. Lysaght, Limited, at £296 for iron and steel work for Molesey Weir.

Workmen's Cottages in Rural Districts.—Replying to a question in the House of Commons on Tuesday, Mr. Herbert Samuel, President of the Local Government Board, stated that since August 1st last the board had sanctioned loans under Part III. of the Housing of the Working Classes Act, 1890, for the erection of 678 houses by thirty-seven rural district councils in fifty-eight parishes. The board had also sanctioned loans for the purchase of land for the same purpose by five other rural district councils in seven parishes.

DRYING AND MIXING OF ROAD MATERIALS.

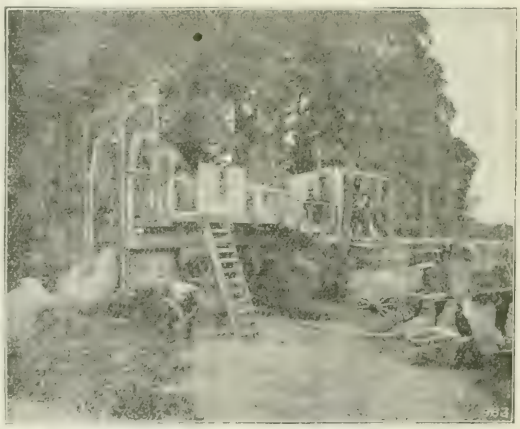
A NEW MACHINE.

On Friday last we had an opportunity of inspecting at M[illegible] drying, and for tar or bitumen mixing, the plant being supplied to Mr. A. Dryland, the county surveyor of Surrey, by the Ransome-verMehr Machinery Company, Limited, of Brunswick House, Westminster, the owners of the patent rights.

We were very considerably impressed with the working of this equipment, more particularly in view of the [illegible]

ling on that particular day. It was being used for pitch macadam foundations made of unscreened, scarified road material mixed with pitch. A very large percentage of the finest dust and even slurry was contained in the bulk of the material, and the test was therefore an unusually severe one.

The machine works normally at the rate of, approximately, 50 tons per day, but is, under favourable con-



Ransome-verMehr Drying and Mixing Machine.

ditions, capable of considerably exceeding this quantity. The batch is ½ cub. yd.

The wet material is delivered by means of an elevating skip to the first revolving drying drum, in which it remains for a period governed by the amount of moisture contained in the stone, and is then delivered to a second drying drum, from which, in due course, it is discharged into a mixer of the double-axle revolving paddle type. During its passage through the two drying drums it is brought into intimate contact with hot gases which are drawn direct from the coke furnace by means of a small fan.

The machine itself is of a very compact type, and is mounted on strong road wheels fitted with springs, so that it forms a semi-portable unit. Taking the plant from a constructional point of view, it was hardly necessary for the company to mention that it was of British manufacture throughout, as it was obviously a very strong and workmanlike machine.

So far as actual results are concerned, the inspection of the material as laid in the roads offered very conclusive proof of the efficiency of the plant. On top

The Surveyor

And Municipal and County Engineer.

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of the pitch-macadam foundations a bitumen carpet is laid, resulting in a road of most excellent finish and even surface, on which Mr. Dryland is to be highly congratulated.

We understand that the particular machine in question is likely to be used for the bitumen carpeting work, as well as for the foundation work, in the near future.

The makers appear to have concentrated their efforts on eliminating labour costs, and we particularly noticed that only one man was employed for actually working the machine itself, this man controlling the elevator skip, the two drying drums and the mixer. This feature is undoubtedly of very great importance to municipal engineers who are using the plants for work of this nature.

We understand from the Ransome-ver Mehr Machinery Company, Limited, that they manufacture these plants in both smaller and larger sizes, and that they cover the complete range of tar-macadam or bitumen road work.

Cumberland Roads.—The county surveyor of Cumberland, Mr. W. [illegible], in his annual report states that the mileage of the rural main roads under the direct control of the county council at the end of the year was over [illegible] miles. The gross expenditure on the rural road surfaces during the year had been £38,708, and, deducting £4,156, amounts received from the Road Board and other sources, the nett total was £34,552. The average cost per mile on the total nett expenditure, including surface improvement works, was £74 13s. The average cost per mile to compare with this figure last year was £66 2s., the increase being chiefly due to the extra amount of surface improvement works, increased cost of team labour, and increased wages of workmen. The sums granted by the Road Board toward the cost of main road surfacing with tar-macadam, approved granite and whinstone, widenings and improvements during the year, amounted to £6,930, including £750 granted for work to be carried out in urban districts. The council have approved the minutes of the Highways Committee, in which it was stated that a sub-committee had reported that they had considered a scheme prepared by the county surveyor for the classification of main roads in the county, and having approved it, they submitted the schedules to the committee. The sub-committee recommended that the classification of the various district roads should be left in the hands of the county surveyor to settle with the district councils and forward to the Road Board. As the necessary details required in connection with such classification involve very heavy work, they recommended that the county surveyor should be empowered to engage assistance, at a cost not exceeding £2 per week, to enable the work to be carried out.

CLEANING OF WATER MAINS.

The cleaning of 3½ miles of 7-in. water main within a week for the Newtown and Llanllwchaiarn Urban District Council is quite a notable piece of work which has just been completed by the "Eric" Water Main Scraper Company, Limited, of Chepstow, Mon.

For the first 2 miles of its course this main passes over some very rough and awkward ground, crossing five deep ghylls or coombes, and falling and rising as much as 90 ft. in a few chains' length.

The cleaning of the first section—a length of 48 chains—had been previously attempted by the local staff. The machine used had jammed, and was cut out eight times before the length was finished, and the work generally had given so much trouble in other ways that it was decided to place the cleaning of the remaining lengths in the hands of the above-named firm, who make a speciality of this difficult and trying work.

The "Eric" Company's staff commenced on October 14th and had completed the whole 3½ miles on the 21st.

Hatch-boxes fixed at intervals divided the main into six sections. The water was turned off each day at 2 p.m., and the work for the day completed, and the water turned on again by 6 p.m., and although

Valve Passed by "Eric" Machine in Main Cleaning Operations.

curtailment of the supply was anticipated and notice given to that effect, little or no inconvenience was experienced by the water consumers, who included some 300 Territorials training in the town.

Trouble was experienced in the first length owing to a misunderstanding, the water being shut off by the reservoir keeper while the machine was running. Eventually the machine was run through this length twice without a stop.

At another point the main rises 85 ft. at a steep angle, and then follows high ground cut by the hydraulic gradient. No difficulty was experienced in this length, however, and the machine ran at a steady pace up the bank, and from hatch-box to hatch-box without a stop. This applies to all the other sections, with one exception, the fifth. In this case the machine picked up a piece of timber 6 ft. long by 5½ in. by 3 in., which it carried to the hatch-box, where it had to be broken up before it could be removed.

The result of the operations is that the working pressure in the town is increased by 20 lb.

The company has now been asked to undertake the cleaning of the town service mains, and it is confidently believed that there will then be an adequate supply for fire purposes, and that the supply to the higher levels will be still further improved.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, [illegible].

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bridewell Place, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums on books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

[illegible]

QUESTIONS.

This week answers are invited to the following questions:

438. Strength of Materials.—If a straight prismatic [illegible] floats in a horizontal position with a weight of 4 cwt. hung to each end, what will be the [illegible] moment at the centre of its length?

439. Stability of Wall. How high may water rise [illegible] side of a vertical wall, 9 ft. high, 27 in. thick, of material weighing 143 lb. per cubic foot, before the resultant force at the base of the wall passes outside the [illegible]?

440. Bending Moment.—A girder, 15 in. deep and [illegible] in span, carries a uniform load of 20 tons, and in addition a load of 10 tons 8 ft. from the left abutment and a load of 10 tons 8 ft. from the right abutment. Draw the bending moment and shear diagrams. (Alex.)

441. Bending Moment.—A beam of 100 ft. span has a load of 2 tons per foot-run uniformly distributed over 40 ft. of its length commencing at 20 ft. from the left-hand abutment. Draw the bending moment diagram. (Alex.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

436. Ventilation. What effect has (*a*) the breathing of animals and (*b*) the combustion of fuel upon the purity of the atmosphere? (T. R.)

During muscular and mental action the complex hydrocarbons of the cells composing the active tissues are oxidised by the oxygen dissolved in the blood derived from the lungs; the oxidation develops the necessary energy for the continuation of the activity of the tissue; the resulting compounds are carbon dioxide and water, both of which are dissolved in the blood, and afterwards exhaled by the lungs, and at the same time the blood is re-oxygenated. The wasted tissues are renewed by the hydrocarbons derived from the food in the lower intestine and dissolved in the blood. Thus life is essentially a process of combustion; the average healthy man in the course of twenty-four hours develops about 3,400 foot-tons of energy. Under normal conditions the volumetric constitution of air expressed as a percentage is: Oxygen, 20·8; nitrogen, 79·2; carbon dioxide, 0·03 to 0·04. The quantity of water vapour present is variable, and in addition there are traces of ammonia, nitric acid, and organic matter; the normal quantity of carbon dioxide is 4 parts in 10,000. Expired air contains about 100 times as much carbon dioxide as fresh air; where living beings are congregated closely together the air becomes vitiated, not only by the absorption of oxygen and the giving out of CO_2, but also by noxious exhalations from the animal body. To a person going from the fresh air into an occupied room containing 7 to 8 parts of carbon dioxide in 10,000 a disagreeable sensation is experienced; if the proportion rises as far as 20 parts in 10,000 [illegible] varied sensations are not due to the mere presence of the extra carbon dioxide, but to the organic matter and vapours. The analysis of expired air [illegible] analysis: Oxygen, 16·4 [illegible] 79·2; carbon dioxide, 4·3; [illegible] water, vapour, and albuminoid ammonia. The temperature of the expired air is approximately 79 deg. Fahr.; so that the air rises towards the ceiling. It is essential that this vitiated air is removed by adequate ventilation before it has time to cool and descend. A very extreme example of the contamination of air due to insufficient ventilation is the Black Hole of Calcutta. (*b*) Fuel consists of carbon and hydrogen combined with one another in various proportions and with other elements to form complex chemical compounds. During the process of combustion the molecules of the fuel are decomposed, the carbon combines with oxygen to form carbon dioxide, and the hydrogen forms water vapour with the oxygen. The combustion of 1 lb. of pure carbon requires about 13⅓ lb. of air, and results in the formation of 3⅔ lb. of carbon dioxide; so that adequate ventilation must be provided for the combustion of fuel, otherwise the oxygen of a closed space is very soon consumed, and replaced by carbon dioxide; also combustion ceases and life becomes insupportable. In addition, various impurities exist in the fuel, such as sulphur and phosphorus; these result in the formation of the corresponding oxides, which are very deleterious to life. Also with fuel there is the smoke nuisance, resulting in the formation of fogs. The acids set free during the combustion of fuel in towns have a destructive effect on the surface of stone buildings. The only way to minimise the latter effects is to centralise the development of power from fuel to districts where the fuel is mined and distribute the energy electrically. The effects of air can be avoided by providing sufficient cubical space per person or animal, and adequate means of ventilation.

437. Underpinning.—A carved column in a church is showing signs of settlement. Describe, with sketches, the method of timbering and underpinning. (L. C. B., *Cleveden*.)

The querist does not state what the column in question is supporting, so it is assumed that it is one of a series, and situated between two arches. The first process would naturally be to relieve the column of as much weight as possible. This could be done by forming strong timber centerings to each of the arches, as shown in Fig. 1. The centres should be supported by stout dead shores, resting upon a sole piece, and the whole must be tightly wedged up to the underside of the arches. Preparations for underpinning the column may now be commenced. The necessary portion of the church floor having been removed, the ground should be excavated down to the underside of the column's foundation. The excavation must be wide enough for the men to work in comfortably, and should be square in plan. At the bottom of the excavation two trenches, parallel to each other, and one on either side of the column, should be dug. The trenches should be about 12 in. from the pillar and 12 in. deep. They should then be filled with concrete, the surface of which should be about 5 in. below the level of the underside of the column. A flat piece of timber about 4 in. thick is then laid on each strip of concrete. Two pointed iron bars are then carefully driven under the column, so that they project about 18 in. on either side and partly over the wooden sleepers on the strips of concrete. Then by driving in oak wedges between the irons and the sleepers these bars can be brought up tightly against the underside of the column. After this the work of underpinning can be commenced. It is always advisable in underpinning operations to do the work in very small sections; therefore it

[illegible] will not be advisable to underpin more than a [illegible] of the column at one time. The ground [illegible] be excavated under one-quarter of the column [illegible] and [illegible] [illegible] the [illegible] of the column will remain [illegible] The [illegible] work in cement mortar, and, if necessary, the old [illegible]

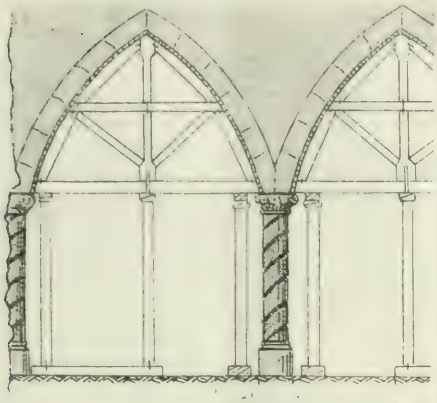

Fig. 1

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.
—Massinger: "The Fatal Dowry," Act ii., 2.

THE TRAINING OF MUNICIPAL ENGINEERS.

To the Editor of The Surveyor.

Sir,—Having read the letter in the report of the Institution of Civil Engineers with regard to the training of municipal engineers, perhaps the views of an assistant who is going through the mill may not be considered out of place.

I may at once take that I am in perfect agreement with [illegible] put forward by the correspondent writing under "A Small Corporate Member" and "M.I.M. and Cy.E."

I was one of the perhaps Mr. Pratt would say [illegible] lucky individuals whose fortune it was to be articled to an engineer and surveyor in a comparatively small town who was not a corporate member of the Institution of Civil Engineers. Since then, however, I have had a large experience in good-sized towns under a corporate member of the Institution of Civil Engineers. I have carefully noted the career of pupils in the larger offices, and have not the slightest hesitation in saying that if I had the chance of serving my articles over again and could choose between a small town and a large one, my choice emphatically would be with the smaller town. I find that in the larger towns pupils are simply thrown headlong into the office and are left entirely to their own resources. From this it appears to me that other assistants in the office are expected to teach the pupil his work, and are also expected to receive no additional remuneration for so doing. Is it therefore likely that an assistant is going to spend both time and trouble with someone else's pupil, in which he has absolutely no interest? The consequence of this is that pupils are left to find out things for themselves, and so get very little training of an actual practical character.

Again, the work in the larger town may certainly be on bigger lines, but that is the most that can be said about it, for the problems that arise are certainly not more complicated, if as much so, and my own experience is that the work is actually carried out in a much inferior way to that of the small town. Many reasons may be given why this is so, but it would take too long in a letter of this description to enumerate them.

Coming to the point of examinations, I found that I derived far greater benefit in studying for the examination of the Institution of Municipal and County Engineers than for the examination of the Institution of Civil Engineers, for the majority of the work done for the Institution of Civil Engineers' examination is of very little use in a municipal office, and I cannot but think that the examination

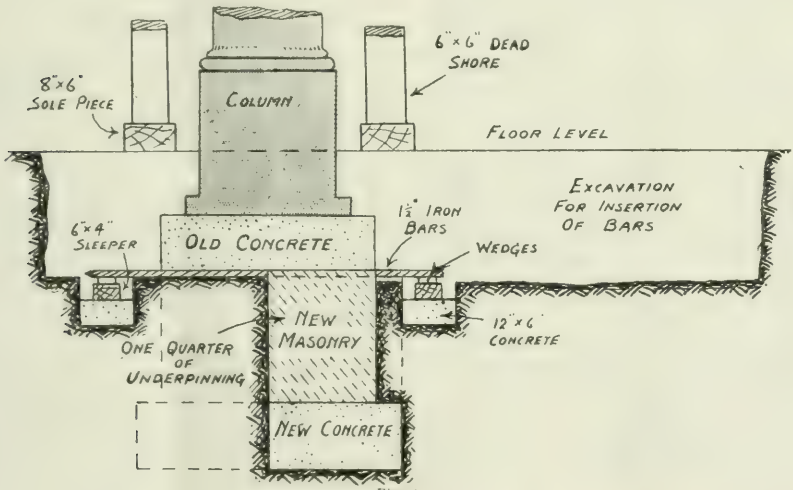

Fig. 2

UNDERPINNING.

wedges in cement mortar. The slate wedges must be driven in very gently. When this is sufficiently set, the next quarter can be underpinned, and so on. The iron bars may be left in on completion of the work to prevent disturbance. In practice it would no doubt be better to take down the entire column and rebuild it, after having supported the arches. Fig 2 shows the position of concrete, sleepers and [illegible] (P. H. *Middleton.*)

Kensington and the Road Board.—The Kensington Borough Council have intimated to the Road Board a desire to carry out a scheme for the improvement of the road crusts in the borough, at a cost of £40,000, conditional on the board making a grant of half the cost and lending the remainder free of interest. The board have replied that the proposal can only be considered if the Local Government Board advise that, in view of the state of employment in Kensington, additional road improvement works should be initiated.

[illegible] be supported, this examination is very undeservedly [illegible] County Engineers owing to this very fact. Why [illegible] institution which practically ignores municipal work when they have a splendid one of their own?

[illegible] ing chief appointments actually are qualified, if ex[illegible] tion? As "M.I.M. and Cy.E." says in his letter, [illegible] have never even served any articles, much less passed [illegible] laugh up their sleeves when they see what an assistant [illegible] nations.

[illegible] offices, where pupils are turned out like sausages [illegible] we hear so much of the overcrowding of the profession, of chiefs complaining of inefficiently trained assistants, and the ridiculously low salaries now being paid to assistants?

It will be seen that I offer no suggestions as to how this state of things is to be remedied, but merely [illegible] be drawn.—Yours, &c.,

ASSISTANT.

[illegible] 14, 1914.

THE FUNCTIONS OF A MUNICIPAL ENGINEER.

To the Editor of THE SURVEYOR.

[illegible] been taken in my remarks regarding reinforced concrete in reservoir construction, and in reply to Mr. H. C Johnson, of University College, Cork, I would [illegible]

(*a*) I recommend that if a reservoir is greater in depth than 30 ft., while it should be constructed in reinforced concrete, buttresses should be added at the back of the wall. Without buttresses, and where the walls are less than, say, 30 ft. high, their thickness should be—First, 6 ft. 5 in.; beyond this, 2 in. increase in thickness for every additional 6 ft. in height. Perhaps I did not make this clear in my lecture.

[illegible] for walls over 20 ft. high.

(*c*) Only the "*best* of aggregates, correctly proportioned, and an absolutely first-class cement," should be used in reinforced-concrete work; 1,800 or even 2,000 lb. per square inch at thirty days is then quite possible, and should be expected.

(*d*) Yes. Taking 600 lb./in.^{2} on concrete. If you refer to my lecture you will see I suggested a thickness of 7 in. for a 10-ft. wall—namely, first, 6 ft. 5 in.; next, 6 ft. 5 in. by 2 in. Probably 5 in. named by me in another part of the lecture was rather light. 4 in. at top of wall and 7 in. at bottom would have been better.

(*e*) It is wise to disregard the weight of water on the heel of a cantilever wall, owing to the possibility of upward water pressure.—Yours, &c.,

E. R. MATTHEWS.

16 Windsor-road,
Palmer's Green, N.
November 18, 1914.

IMHOFF PATENT SEWAGE TANK.

To the Editor of THE SURVEYOR.

SIR,—We applied to the Board of Trade on August 24th last, that the above patent should be revoked in favour of all public authorities undertaking sewage purification works. After a certain amount of correspondence with the Board of Trade, we were requested to apply for the suspension of the letters patent in our own names, and did so on September 10th. The case was heard on October 28th, and the tribunal clearly indicated that they should consider the Royalty of 10 per cent now charged excessive if no advice was included, and that the Board of Trade would probably [illegible] the apparatus, of about 5 per cent in the case of small [illegible] where a [illegible] of tanks were installed.

We [illegible] copy of a letter we have just received from the Board of Trade.—Yours, &c.,

STRACHAN & WEEKES.

9 Victoria-street,
Westminster, London, S.W.
November 19, 1914.

[COPY.]

Board of Trade
C 15764 Whitehall, S.W.
November 14, 1914.

GENTLEMEN,—I am directed by the Board of Trade to refer to your application to the Board of Trade to order the avoidance or suspension of Letters Patent No. 10984 of 1907, and to inform you that the Board of Trade have decided to make no order in the matter.

I am to state that the sole reason of the board for not granting the application is that it would not be effectual, seeing that you do not propose yourselves to use the patented apparatus, but only to recommend its use. I am to add that if any local authority desire to use the apparatus, they should make application under the rules for that purpose, when the board could consider the advisability of suspending the patent in their favour, and of fixing such Royalty as might be thought reasonable.

I am, Gentlemen,
Your obedient Servant,
(Signed) G. S. JAMES.

Messrs. Strachan & Weekes,
Consulting Engineers,
9 Victoria-street, Westminster.

HUTS FOR SOLDIERS.

[It may be useful to recall at the present time the description which was given of the buildings that were erected to the north-east of Crownhill, Plymouth, from War Office plans.]

They consist of about forty-six hutments, the greater portion being of one pattern and similar in detail to those which were put together in South Africa for the accommodation of troops. Each hut is 75 ft. long and 22 ft. wide. It stands a foot or two off the ground, being supported by brick pillars and a cement bordering, ventilation being provided by means of perforated bricks let into the cement here and there. On an average each building is 10 ft. high. The material used in the construction is corrugated iron with match-boarding and felt lining. The roof is ingeniously designed, both in respect to ventilation and to keep out the rain. Double boarding of the roof is so arranged as to allow a continuous current of air to pass between the two layers of match-wood, while on the summit is a curved corrugated iron ventilator. There are fourteen casement windows, and the ante-rooms include a small but well-fitted store, and a mess-room for the non-commissioned officers. Each of the huts will accommodate twenty-five men. There are thirty-two huts of this type, and all are heated by slow combustion stoves and lighted with oil lamps. Before being occupied the interiors were stained, sized, and varnished, and the exterior woodwork painted There are two cook-huts, in connection with which there are baths for the use of the men. These are built upon a basement of concrete and measure 64 ft. by 18 ft. The sergeants' mess is of similar dimensions, and a section of it is set apart for cooking. In interior construction the canteen and recreation huts differ considerably from the others. They are fitted with baths, and the bar fittings are similar to those in barracks of a more permanent standing.

The officers' quarters are separated from those of the men by a space of about 100 yds. They measure 64 ft. by 18 ft., and have lavatories attached. Each of the four huts set apart for living in is partitioned off into rooms, with separate entrances from the exterior. In a few instances the accommodation is for two officers. The individual compartments measure 17 ft. by 11 ft., and are slightly higher than in the men's huts. In the centre of the group is the mess, fitted with lavatories, and connected to the kitchen hut in the rear by a corridor.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making this information more useful. Dates [illegible] are those of the inquiries as given.

INQUIRIES HELD.

Clitheroe T.C. (November 6th. Mr. Edgar [illegible]).—£1,200 for widening Waterloo-road. The engineer, surveyor, Mr. A. E. Blackburn, stated that the road was now a cul-de-sac, the property, the county council had recommended the Council to recognise it as a first-class road. In parts it was only [illegible] ft. wide, and there was no footpath.

Hull T.C. (November 7th. Mr. R. H. Bicknell).—£7,500 for the erection of a bathing lake on Pearson's Recreation Park. It was expected that it was proposed to make the lake 200 ft. in length and 175 ft. in average width. The proposed depth was 3 ft. The lake was made 2 ft. 6 in. deep but experience showed that it was not enough, and the lake was deepened a further 6 in.

Llanelly U.D.C. (November 13th. Mr. F. H. Tulloch).—£1,300 for the purchase and laying out of land at Bigyn as a recreation ground. The engineer, Mr. George Watseyes, said that the proposed work was to extend pleasure grounds given to the town in 1912.

Ludlow T.C. (November 17th. Mr. H. S. Stewart).—£4,000 for the purchase of land and for the erection of working-class dwellings.—The town clerk, Mr. J. H. Williams, said it was proposed to erect altogether twenty-one houses, at a cost of £3,780, the rents to be 4s. 6d. per week. The income from them would be £249 14s.

Neath T.C. (November 13th. Mr. H. R. Hooper).—This was an inquiry into the application for a Provisional Order to extend the council's borrowing powers in connection with the Corporation Waterworks Act. The town clerk explained that the borrowing powers under the Act of 1894 and Provisional Order of 1898 were now nearly exhausted. A capital [illegible] had been borrowed, and only £3,106 remained under the powers to be borrowed; £14,000 had been repaid. The water undertaking was in a satisfactory condition and was self-supporting.

Nottingham T.C. (November 12th. Mr. P. M. Crosthwaite).—£11,100 for the widening of Hucknall-road from 40 ft. to 60 ft.; £11,000 for piling and foreshore works on the south bank of the Trent; £700 for a road improvement on Bulwell Forest and the laying of a concrete floor to the children's paddling place created by the Bull Well; £600 for the extension of the Sycamore-road recreation ground by the laying of another bowling green; and £3,000 for culverting the river Leen between the Cattle Market road and Meadow lane. The city engineer, Mr. A. Brown, said the excavation necessary on Hucknall-road would probably occupy 150 to 200 men for two or four months. The Trent work was dependent on the height of the river, and would probably be spread over twelve months. It would largely employ unskilled labour. The third and fourth schemes would employ a big proportion of unskilled labour, and the culverting would be done principally by skilled labour. It was asked that the money should be advanced for the full term of sixty years.

Sheffield T.C. (October 10th. Mr. R. H. Bicknell).—£2,000 for the widening of Sandygate-road. Mr. C. F. Wike, M.Inst.C.E., the city engineer, stated that the road led from the city to the Lodge Moor fever hospital, and that its present average width was from 20 ft. to 30 ft. The length of the proposed improvement was about [illegible] yds., and it was intended to make the road 50 ft. wide. Inquiring later into a proposed expenditure of £680 on the purchase of certain land and the laying out of a portion of the ground as a bowling green, the inspector remarked that the amount allowed for the making of the green, namely, £[illegible], was remarkably small. At an inquiry held some time [illegible] a scheme of the same character was sanctioned at £[illegible].

APPLICATIONS FOR LOANS.

Chesterfield T.C.—£7,020 for a sanitary conversion scheme.

Elland U.D.C.—£[illegible] for the Lane Wall improvement scheme.

Failsworth U.D.C.—£1,197 for private street works.

Hucknall U.D.C.—£3,400 for laying out Titchfield Park.

Ipswich T.C.—£6,315 for street improvements.

Littlehampton U.D.C.—£200 for sewer ventilation.

Maldens and Coombe U.D.C.—£1,545 for private street works.

Malton R.D.C.—£14,965 for works of water supply.

Newport (I.W.) T.C.—£2,000 for new plant for the gas works, the existing plant being [illegible] worn out.

Northfleet U.D.C.—£7,200 for the purchase of the Northfleet House estate.

Poole T.C.—£500 for the purchase of a site at Corfe Hills for the purpose of a [illegible].

Ramsbottom U.D.C.—£8,631 for road improvement.

Salisbury T.C.—£398 for road works.

Sheffield T.C.—£20,000 for a tuberculosis sanatorium.

Shrewsbury T.C.—£1,200 for school extension.

Southend T.C.—£3,257 for making up certain streets, and £4,166 for works of sewerage.

Stroud U.D.C.—£500 for working-class houses.

Sunderland R.D.C.—£21,000 for the erection of eighty-three workmen's dwellings.

Swansea R.D.C.—£21,050 for a sewerage scheme for Fforesfach and Waunarlwydd.

Teddington U.D.C.—£1,000 for a motor fire engine.

Tunbridge Wells T.C.—£7,520 for new electrical machinery.

Worcester T.C.—£9,875 for two additional water filters and other works.

LOANS SANCTIONED.

Armagh R.D.C. £1,080 for the provision of cottages.

Brierfield U.D.C.—£320 for works of street improvement.

Carnarvon T.C.—£290 for a hospital, and £150 for improvements at the public slaughterhouse.

Colchester T.C.—£3,110 for a tuberculosis pavilion.

Harwich T.C.—£4,350 for works of sewerage.

Holborn B.C.—£15,568 for street widening.

Keighley T.C.—£17,000 for the electricity undertaking.

Littlehampton U.D.C.—£3,300 for the erection of a hospital.

Penybont R.D.C.—£1,560 for road improvement.

Sandown U.D.C.—£368 for the purchase of a steam roller.

Shanklin U.D.C.—£3,600 for the purchase of The Landslip.

Southend T.C.—£4,512 for the improvement of the Broadway.

Surbiton U.D.C.—£2,137 for a chapel and lodge at the new cemetery.

Surrey C.C.—£8,000 for the purchase of property for the purpose of a hospital.

Tandaragee R.D.C.—£1,300 for a water supply for Laurelvale.

Wakefield T.C.—£13,145 for working-class houses.

Welwyn R.D.C.—£4,505 for workmen's dwellings.

Yarmouth T.C.—£1,200 for laying out Southtown Common.

FORTHCOMING INQUIRIES.

NOVEMBER.

		£
23.	**Finchley.** For the provision of a refuse destructor and open spaces (Mr. R. H. Bicknell)	16,847
24.—	**Blofield.** For a housing scheme (Mr. C. H. Eyles)	1,800
24.—	**Bolton.** For road construction and widening (Mr. F. H. Tulloch)	28,505
24.—	**Horsham.** For the provision of a dispensary and clinic (Dr. A. S. MacNalty)	500
24.—	**Itchen.** For the purchase of a steam water and haulage wagon and gravel pit extension (Mr. R. H. Bicknell) ...	1,440
25.—	**Rochdale.** For sewerage and road works (Mr. F. H. Tulloch)	[illegible]
25.—	**Stoke-on-Trent.** For the electricity undertaking (Mr. H. R. Hooper) ...	—
26.—	**Batley.** For street works and the provision of water purification plant (Mr. F. H. Tulloch)	[illegible]
26.	**East Ellloe.** For the erection of workmen's houses (Mr. C. H. Eyles) ...	1,972
26.—	**Oldham.** For electricity purposes and road improvement (Mr. H. R. Hooper)	45,545
27.—	**Bradford.** For works of sewerage (Mr. F. H. Tulloch)	[illegible]

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Ipswich, Sheffield, Surrey; housing and town planning—Northampton, Rugby; roads and materials—East Riding, Glasgow, Herts, Neath, Ramsbottom; sewerage and sewage disposal—Doncaster; water, gas and electricity—Northwich. Particulars of other works projected will be found in our "Local Government Board Inquiries" page.

ADMINISTRATION.

Staffs C.C.—A recommendation was submitted by the Finance Committee last week that the staff of the county surveyor, Mr. J. Moncur, should be taken over and paid direct by the council, and that the salary of the county surveyor be £850. Questions were asked and answered by Mr. G. Macpherson, chairman of the Finance Committee, who explained that the proposals in regard to the county surveyor's department would be adjourned until after the war.

BUILDINGS.

Blackrock U.D.C.—Official sanction has been given to a scheme for the erection of an electricity generating station.

East Riding C.C.—Steps are to be taken for the purchase of Raywell House for the purpose of a sanatorium. The estimated cost of the scheme is £13,075, or £205 per bed.

Ipswich T.C.—Plans have been approved for the extension of the borough mental hospital, at an estimated cost of £3,300.

Lanark T.C.—The council have approved of a scheme to make a considerable addition to the present fever hospital at an estimated cost of £2,000.

Lanarkshire C.C.—It has been agreed by the Upper Ward District Committee to erect a pavilion for twenty-four beds, and the necessary staff accommodation, at Roadmeetings Hospital, Carluke.

Oldham T.C.—Extensions are to be effected at the tramway car shed at Hollinwood, at an estimated cost of £1,600.

Penrith R.D.C.—The surveyor, Mr. W. S. Lythgoe, has received instructions to prepare plans and estimates for a lodge at Ivegill.

Saffron Walden T.C.—The corporation have approved the plans of Mr. Hugo R. Bird for an isolation hospital.

Sheffield T.C.—The Health Committee recommend the erection of two dispensaries, at an estimated cost, including furnishing, of £6,151.

Shrewsbury T.C.—Purifying plant is to be installed at the public swimming bath, at an estimated cost of £850.

Shropshire C.C.—On the recommendation of the Roads and Bridges Committee, it has been agreed to strengthen and widen Ercall Mill Bridge at a cost of £1,250.

Surrey C.C.—The Finance Committee have adopted an estimate of £5,500 for constables' cottages in several districts.

Tyrone C.C.—With reference to the proposal to extend the accommodation of the sanatorium from twenty-eight to fifty-six beds the Local Government Board wrote that it would be wiser not to make the extension, but to use the money proposed to be spent on it in furtherance of a scheme for local homes for patients returning from the sanatorium. They preferred the small sanatorium with local homes to the large one without them.

HOUSING AND TOWN PLANNING.

Bridgwater R.D.C.—Amended plans have been approved for the housing scheme.

Clydebank T.C.—The council are recommended by a committee to purchase 16 acres of land on Kilbowrie-road for the erection of artisans' dwellings.

Northampton T.C.—In connection with the Hollowell water scheme it is proposed to provide twenty workmen's cottages at a cost of £220 each.

Northwich U.D.C.—The plan of the surveyor, Mr. J. Brooke, has been approved for the erection of houses in Churchwalk.

Renfrewshire C.C.—The Lower District Committee have resolved to erect cottages for their roadmen at Bay[illegible] and Kennedy.

Rugby R.D.C.—Plans of the proposed new cottages have been approved. The estimated cost per pair of those at New Bilton is £440, and for the rural cottages the cost is £350 per pair.

REFUSE COLLECTION AND DISPOSAL.

Crompton U.D.C.—Application has been made to the Public Works Loan Board for the advance of £4,012 for provision of a refuse destructor and steam disinfector in accordance with sanction received from the Local Government Board.

ROADS AND MATERIALS.

Aberdeen C.C.—The Deeside District Committee have appointed a committee to consult with other local authorities on the proposed reconstruction of the old military road from the Dee to the Spey, from Ballater by way of Tomintoul to Cranstown-on-Spey.

Atcham R.D.C.—Improvements, towards which Lord Barnard has contributed £200, are to be carried out at Kenley Hall-road.

Bognor U.D.C.—A scheme is being prepared for widening Marne-road at a cost of £9,000.

Derby T.C.—Property valued at £600 is to be purchased for the widening of Queen-street.

Down C.C.—The council have adopted a report of the Proposals Committee, recommending that the Local Government Board should be called upon to make an order amending the conditions of the assistant surveyor's service, with a view to their number being reduced and the remainder becoming whole-time officers, and to raise the limit of road expenditure by £10,000 in all the rural districts except Castlewellan and Moira.

Dumfries T.C.—A decision has been reached to proceed with the King-street improvement scheme.

Durham C.C.—The council have agreed to the scheme of the Chester-le-Street Rural District Council for an improvement at Havanale Bank, Washington-road. The estimated cost is £1,050. The gradient of Pelton-road is also to be improved at a cost of £2,460.

East Riding C.C.—Negotiations are proceeding with respect to the improvement of the main road between Hessle and Hull, the cost of which is estimated at £7,434.

Forfarshire C.C.—An improvement scheme is to be carried out on the Marykirk-to-Logie-Pert road, at an estimated cost of £1,438, and towards this the Road Board have sanctioned a grant of £705.

Glasgow T.C.—A joint deputation representing the town council and the Dumbarton County Council has had an interview with the Road Board as to their making a grant towards the cost of the construction of the proposed extension of Great Western road from Anniesland Cross to Duntocher. The proposed boulevard is to be 4¾ miles in length and 140 ft. in breadth. It is estimated to cost £258,000. An effort is to be made to obtain a grant of £250,000.

Hartlepool T.C.—Plans have been approved for making up Back Hart-road and Back Union-road.—It has been agreed to fix a scarifier to the steam roller.

Hastings R.D.C.—It has been resolved to make up certain streets in the Shotton and Hawarden districts.

Herts C.C.—A scheme of road improvement, estimated to cost £28,000, is to be carried out at Bushey.

Highworth R.D.C.—Plans have been approved of the proposed improvement of the Draycott road leading to the camp, the cost of which is estimated at £3,327, and the War Office has been invited to contribute towards the scheme.

Keighley T.C.—The space round the bandstand in Victoria Park is to be tar-macadamised at a cost of £200.

Middlesex C.C.—An intimation has been received from the Road Board that they were prepared to make

[illegible] instead of the cost of wood paving. Turnpike [illegible] and [illegible] Philippine and Westbury [illegible].

Mold U.D.C.—The surveyor, Mr. David Thomas, has received instructions to prepare the estimates on the [illegible] for all the [illegible] in this.

Neath R.D.C.—A letter has been received from the clerk to the Glamorgan County Council stating that [illegible] would be prepared to support the application of the rural council to the Road Board and Local Government Board for a grant of 50 per cent of the total cost of the proposed new road through the Dulais Valley from Ynisgerwn to Rhos Common. The total cost of the new road was estimated at £16,000. The county council, it was stated, had approved the plans of the road and had agreed to make a substantial grant towards its maintenance when completed.

Newark T.C.—Asphalting work is to be carried out at the Bass Square school, at an estimated cost of £132.

Pembrokeshire C.C.—It is announced that the Road Board have intimated that they are prepared to meet the cost of the construction of two military roads, one at Pembroke Dock, through Pembroke to the Angle Forts, and the other from Neyland along the north shore of the Haven to Dale.

Ramsbottom U.D.C.—A scheme has been approved for the reconstruction of a portion of Helmshore-road, at an estimated cost of £12,946, towards which the Road Board have sanctioned a grant of £4,315.

St. Columb R.D.C.—A committee has been formed to go into the question of constructing a new road from Wadebridge to Ruthern Bridge.

Shropshire C.C.—It has been agreed to pay the roadmen's wages weekly instead of fortnightly as hitherto. The Roads Committee reported that arrangements had been made for the carrying out of road improvement schemes and other works with the object of providing labour in the event of distress occurring through lack of employment owing to the war.

Stanley U.D.C.—A resolution has been adopted in favour of the construction of a new road to Newcastle, and it has been agreed to approach the Tanfield Urban District Council with respect to the scheme.

Warrington T.C.—It has been decided to proceed with the proposed improvement at Market-gate, at an estimated cost of £30,000.

Wortley R.D.C.—The surveyor of highways, Mr. F. A. Crawshaw, has prepared estimates of the cost of thirteen suggested highway improvements, which he has forwarded to the county council for submission to the Road Board. The total estimated cost of the schemes is £2,762.

Youghal U.D.C.—The council have approved the scheme of road improvement at Clifton, at an estimated cost of £3,000, and have decided to apply to the Road Board and the Cork County Council for grants towards the cost of the works.

SEWERAGE AND SEWAGE DISPOSAL.

Clutton R.D.C.—Sewerage works are to be carried out at Rotcombe, at an estimated cost of £285.

Doncaster R.D.C.—Land has been purchased at Bamborough for the purpose of sewage disposal works.

Gwyrfai R.D.C.—The council have instructed their consulting engineers, Messrs. Berrington, Son & Watney, to prepare a scheme for the sewerage and sewage disposal of Ebenezer and Clwytbont.

Matlock U.D.C.—Some years ago the two Matlock Councils agreed that the larger Matlock should carry out a £40,000 sewerage scheme. The work has progressed considerably, and a few days ago the Matlock Council wrote Matlock Bath notifying that their share of the cost, £10,000, would be due this month. It has now been discovered that the money cannot be claimed until the last payment of the contract has been signed, and this is at least a year off yet. Matlock Bath will not, therefore, pay their £10,000.

Rochford R.D.C.—Application is to be made for a Provisional Order for the promotion of a sewage disposal scheme.

Wakefield T.C.—An electrically-driven crane is to be installed at the sewage disposal works for the removal of sludge from the detritus tanks.

Walsall R.D.C.—The council have granted permission to their engineer and surveyor, Mr. W. P. Young, to undertake consulting work on sewerage and sewage disposal outside the council's area.

WATER, GAS, AND ELECTRICITY.

Aberdeenshire C.C.—It is proposed by the Deer District Committee to carry out improvements of the New Pitsligo water supply, at an estimated cost of £1,650.

Dumbartonshire C.C.—The Eastern District Committee have adopted a scheme of water supply for Cumbermauld and Kirkintilloch.

Gwyrfai R.D.C.—The council have under consideration a report prepared by Messrs. Berrington, Son & Watney, of Wolverhampton and Westminster, dealing with the proposed water supply scheme for the villages of Ebenezer and Clwytbont.

Northwich R.D.C.—The surveyor, Mr. J. Brooke, has prepared a scheme for a water supply for Barnton and other districts, at an estimated cost of £29,346.

Sedgley U.D.C.—After the payment of all liabilities there remained a nett profit from the gas undertaking in the last financial year of £1,058.

Spalding R.D.C.—The Local Government Board have intimated to the council that they will be prepared to sanction a loan for experimental boring at Deeping St. Nicholas.

MISCELLANEOUS.

Battle R.D.C.—It has been agreed to accept the tender of Messrs. Tills, Limited, of High-street, Battle, to supply "best bass" brooms for scavenging at 32s. 3d. per dozen. The tender was the highest of three, but was accepted as the quality was better than the other brooms tendered for.

Swanage U.D.C.—Regarding the tenders for the new carts, the surveyor, Mr. W. H. Pearce, reported that he had ascertained that the work could not be carried out locally, and it was decided to ask the Bristol Wagon Company to furnish a specification and quote a price.

PERSONAL.

Mr. B. A. Miller, surveyor to the Seaford Urban District Council, has been voted £50 for extra services in connection with the sewerage scheme.

Mr. Thomas Moulding, city engineer and surveyor of Exeter, has been elected a Fellow, and Mr. William J. Bidgood, Public Works Department, Shanghai, China, a member of the Royal Sanitary Institute.

Mr. K. G. Foster, assistant to Mr. Wilfrid J. Goode, engineer and surveyor to the Buckfastleigh Urban District Council, has been appointed assistant engineer and surveyor to the Chelmsford Rural District Council.

Mr. William Owen Jones, Aelybryn, Wrexham, has been appointed assistant county surveyor (roads and bridges department) for East Denbighshire. Mr. W. O. Jones served his articles for three years with the borough surveyor of Wrexham, Mr. John England, and was for some time engaged on the permanent staff of the borough. He was for two years in the Inland Revenue Office, Valuation Department, as surveyor and assistant valuer, and for the past two years has been assistant to the Eastern Division county surveyor.

Prof. W. G. Fearnsides, M.A., Sorby Professor of Geology at the University of Sheffield, was last week presented with the Gold Medal of the Surveyors' Institution for the paper entitled "The Part Played by Water in Macadam Road Construction," which he read at a meeting of the institution on November 24, 1913 [THE SURVEYOR, November 28th and December 19, 1913]. In making the award, said the president, in presenting the medal, the council had taken into consideration the scientific nature of the paper, as well as its practicability. The earlier part of it was full of scientific thought and knowledge, and the latter part dealt with the practical application of those principles. In returning thanks, Prof. Fearnsides said the kind reception given to his paper had been a great encouragement to him to pursue the work he had undertaken in connection with the investigation of the scientific and chemical problems presented in road making, and he was sure the honour they had done him that evening would urge him on to make more strenuous and greater efforts in the same direction.

Local Loans in War Time. [illegible] in the House of Commons on Monday, Mr. Herbert [illegible] stated that the amount [illegible] in public loans [illegible] by the local [illegible] was £[illegible] and the [illegible] £25

FOR OTHER ADVERTISEMENTS

See End of Paper.

SURVEYING ASSISTANT and Draughtsman. Wanted, temporarily, in an Urban Council Sur[illegible] Office. [illegible] Assistant well experienced in the preparation of schemes for Main Sewerage and Sewage Disposal, details, quantities and estimates; must be quick and accurate surveyor and leveller, and good draughtsman. Applications to state age, particulars of training and experience, and [illegible] recent testimonials.—Box 1,487, office of THE SURVEYOR, 21 [illegible] E.C. (2,098)

SURVEYING ASSISTANT (20), Intermediate F.S.I., desires appointment in Municipal Office. Three years' articles; practical experience in Building Construction, Surveying, Levelling, and [illegible] Box [illegible] THE SURVEYOR, 21 [illegible] E.C. (2,100)

THE RURAL DISTRICT COUNCIL OF GODSTONE.

HIGHWAYS AND BRIDGES DEPARTMENT.

The above Council invite Tenders for Tar-washing certain Highways within their District during the Season of 1915.

Forms of Tender can be obtained from the undersigned upon receipt of a stamped and addressed foolscap envelope.

Tenders must be sealed and marked on the outside "Tender, Tar-washing," and must be delivered to me not later than 12 noon on Friday, the 4th day of December, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. E. CROWTER,
Engineer and Surveyor

High-street,
Godstone,
Surrey.

November 18, 1914. (2,097)

TOTTENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Council invite Tenders for Making Up Reform-row (Section 1).

The Plans can be seen, and Forms of Tender and other particulars can be obtained, on application to Mr. W. H. Prescott, M.INST.C.E., Town Hall, Tottenham.

The sum of £5 will be charged for the Quantities, which will be returned on receipt of a *bonâ-fide* Tender, accompanied by the Conditions, Specification, and Quantities, otherwise the deposit will be forfeited.

The Contractor will be required to pay all workmen on the Council's work the recognised Trade Union rate of wages. A Schedule of such wages will be inserted in the Contract, and a copy of the Schedule must be exhibited on the Pay Office at the Works.

Canvassing Members of the Council is strictly prohibited, and if any Members, Agents, or Representatives of Firms tendering for this work interview or canvass Members of this Council, Tenders sent in from such Firms will be immediately disqualified.

Sealed Tenders, on the Form supplied, endorsed "Tender for Making Up Reform-row (Section 1)," to be delivered to me by twelve o'clock noon on Tuesday, 1st December, 1914.

No other Form of Tender will be received.

Security will be required for the due performance of the Contract.

The Council will not be bound to accept the lowest or any Tender and reserve the right to accept a part only of any Tender received.

(By order)
VINCENT A. BALLS.
Acting Clerk of the Council.

Tottenham.
November 13, 1914. (2,099)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. PICKERING, M.INST.C.E., Borough Engineer, Cheltenham.

WEST MIDLAND DISTRICT.

A meeting will be held at Birmingham on Thursday next, November 26th.

AGENDA.

5.30 p.m.—Meet at the Council House, Birmingham, To elect Executive Committee for the ensuing year.

Discussion on paper by Mr. E. J. Goodacre, ASSOC.M.INST.C.E., assistant borough surveyor, Shrewsbury, entitled "Timber and its Relation to the Building By-laws."

F. C. COOK, ASSOC.M.INST.C.E.,
Hon. District Secretary.

Municipal Offices,
Nuneaton.

COLE TESTIMONIAL FUND.

It is proposed to close the above fund in time for inserting the names of the subscribers in the December issue of the *Journal*. It is hoped therefore that members who have not already done so will kindly forward their contribution to me at an early date. The suggestion that the subscription should be from 1s. to 5s. was made to enable each individual member to show his appreciation of the great services rendered by our late secretary, Mr. Cole. At present less than half the members have subscribed, but I feel sure that it only needs this reminder to bring in the remainder of the contributions before the appointed time.

J. S. PICKERING,
President.

Municipal Offices,
Cheltenham.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E., Tunbridge Wells and Westminster.

President-Elect—Mr. W. H. MATTHEWS JONES, City Engineer and Surveyor, Chester.

ANNUAL MEETING IN LONDON.

The sixth annual general meeting will be held in London on Saturday, November 28th.

PROGRAMME.

11.45 a.m.—Meet in the Council Chamber, No. 4 Southampton-row, London, W.C.

12 noon.—Annual general meeting.
Minutes of last meeting.
Presentation of annual report of council.
Announcement of result of ballot for election of council for the year 1914-15.
Any other business.

1 p.m.—Adjourn for lunch.

2.30 p.m.—Re-assemble in Council Chamber.

2.45 p.m.—Presidential address.

Discussion on the following papers to be presented to the meeting:—

"A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts," by G. Belson Chilvers, M.R.SAN.I. (member).

"Housing of the Working Classes," by Edward Whitwell (member).

"The Future Control and Maintenance of Rural Roads," by J. S. Wooddisse (member).

The papers will be taken as read, and advance copies may be obtained on application to the secretary, and will be forwarded as soon as the papers are in print.

B. WYANE,
39 Victoria-street, S.W. *Secretary*

New London Tramway Schemes. The London County Council have adopted a report of the Highways Committee that application be made to Parliament in the Session of 1915 for authority to carry out tramway extensions in districts where the consent of the local council has been obtained.

East Sussex Road Improvement Scheme.—A report [illegible] amount of work in connection with the maintenance, repair and improvement of the main roads, with a [illegible] more supervision of the men and of the works on the [illegible] These inspectors will find their own bicycles, and [illegible] paid at the rate of 18s. per week should be paid 5d. [illegible] and Bridges Committee.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY ASSISTANT.—November 21st. Kesteven Urban District Council. £80 per annum. Mr. John Bond, clerk.

TEMPORARY ENGINEERING ASSISTANT. November 21st. Corporation of Exeter. £4 4s. per week. Mr. Thos. Moulding, city engineer and surveyor, Municipal Offices, Southernhay West, Exeter.

DISTRICT SURVEYOR OF ROADS. November 21st. Lancashire County Council. £200—£325 a year.—Mr. Harcourt E. Clare, clerk, County Offices, Preston.

CLEANSING INSPECTOR.—November 23rd. Finsbury Borough Council. £200—£250 a year.—Mr. G. W. Preston, town clerk.

ASSISTANT ENGINEER. November 23rd. Corporation of Dublin. £3 3s. per week. Chairman, Improvements Committee, City Hall.

INSPECTOR AND SURVEYOR OF HIGHWAYS.—November 23rd.—Whittlesey Rural District Council. £77 per annum.—Mr. J. Peed, clerk, Council Offices, Whittlesey, near Peterborough.

ROAD SURVEYOR.—November 23rd.—Hipperholme Urban District Council. The Clerk, 4 Harrison-road, Halifax.

BURGH SURVEYOR.—November 23rd.—Airdrie Town Council. £130 per annum.—Mr. T. Thomson, town clerk.

BURGH SURVEYOR AND INSPECTOR.—November 23rd.—Keith Town Council. £100 a year.—Mr. J. G. Fleming, town clerk.

TEMPORARY SURVEYOR.—November 24th.—East Sussex County Council. £78 per annum.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

CLERK OF WORKS.—November 24th.—West Suffolk County Council. £2 15s. per week.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

ARCHITECTURAL ASSISTANT.—November 24th.—Ilford Urban District Council. £140—£200 a year.—Mr. H. Shaw, engineer and surveyor.

RESIDENT ENGINEER.—November 24th.—Easington Rural District Council.—Mr. W. G. W. Noble, acting clerk, Council Offices, Easington, Easington Colliery, Co. Durham.

SURVEYOR AND INSPECTOR.—November 24th.—Wimborne and Cranborne Rural District Council. £120 per annum.—Mr. M. Luff, clerk, Council Offices, Wimborne.

CLERK OF WORKS.—November 26th. Petersfield Rural District Council. £2 10s. per week.—Mr. A. J. C. Mackarness, clerk.

HIGHWAY SURVEYOR.—November 28th. Llandudno Rural District Council. [illegible] Mr. J. [illegible] Bay, Llandudno, North Wales.

JUNIOR ENGINEERING ASSISTANT.—November 25th.—Corporation of Bolton. £65 per annum.—Mr. Samuel Parker, town clerk.

TEMPORARY SURVEYOR AND INSPECTOR.—November 26th.—Warlingham Urban District Council. Mr. Edwin T. Cooper, clerk, Council Offices, Bagshot, Surrey.

SECOND ASSISTANT ENGINEER.—November 27th.—Corporation of Guildford. £90—£110. Mr. E. Young Harrison, borough engineer.

SURVEYOR'S CLERK.—November 27th.—Corporation of Guildford. £65 a year. Mr. E. Young Harrison, borough engineer.

ROAD FOREMAN.—November 27th.—Cannock Urban District Council. 30s. per week, with house rent.—Mr. R. Blanchard, engineer and surveyor, Council Offices.

ASSISTANT COUNTY SURVEYORS.—November 30th.—Cornwall County Council. £150—£200.—Mr. Christopher L. Cowlard, clerk, County Council Offices, Bodmin.

SURVEYOR.—December 5th.—Pontypool Rural District Council. £100 per annum. Mr. T. Watkins, clerk, Club Chambers, Pontypool.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance. Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port of Spain, Trinidad, B.W.I.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SOUTHEND.—December 4th.—Schemes for a tuberculosis hospital, for the corporation. Premiums £100, £50, and £25.—Mr. E. J. Elford, borough engineer.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

ELLAND.—(No date.)—Reports, plans and estimates for the improvement of the sewage disposal works, for the Elland Urban District Council.—Mr. J. Clarkson, clerk, Council Offices, Elland.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BARROW.—November 23rd.—For the erection of a public library, for the corporation.—Borough Engineer and Surveyor.

HENDON.—November 23rd.—For the erection of a bungalow, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

LONDON.—November 24th.—For the erection of an annexe to engine-house at Abbey Mills pumping station, for the county council.—Chief Engineer, Spring-gardens, S.W.

SELBY.—November 24th.—For the construction of a subway road and retaining walls, for the urban district council.—Mr. Bruce McG. Gray, Council Offices, Selby.

CHESTER.—November 24th.—For the erection of a school, for the Administrative Committee.—Messrs. J. M. Davies & Sons, 14 Newgate-street, Chester.

MALDON.—November 24th.—For the construction of the Tollesbury waterworks, for the rural district council.—Mr. W. Almond, engineer and surveyor, 6 Market-hill, Maldon, Essex.

DUNDALK.—November 24th.—For the erection of a [illegible] for the Local Government Board, [illegible]

CHICHESTER.—November 24th.—For the erection of a school, for the West Sussex and Chichester Joint Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WEST HAM.—November 24th.—For the erection of [illegible] the new tuberculosis hospital, laying foundations, and other works, for the London County Council.—Mr. [illegible], Spring-gardens, S.W.

SALOP.—November 24th.—For the erection of a school, for the Education Department.—Mr. H. E. Wale, secretary, County Buildings, Shrewsbury.

BRIDGWATER.—November 24th.—For the construction of a temporary hospital, for the corporation. [illegible]

ARMAGH.—November 24th.—For the erection of a dispensary, for the county council.—Messrs. Kaye, Parry & Ross, architects, 48 Kildare-street, Dublin.

WEST SUSSEX.—November 24th.—For the erection of a school, for the Joint Education Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

FINCHLEY.—November 25th.—For the erection of an overground convenience, for the urban district council.—Mr. C. J. Jenkin, surveyor.

WANSTEAD.—November 25th.—For the erection of a caretaker's cottage and making up an avenue, for the urban district council.—Council Offices, Wanstead, N.E.

BRISTOL.—November 26th.—For the reconstruction of the cattle market, for the Market Trustees.—Mr. P. Addis, The Exchange, Corn-street, Bristol.

LINDSEY.—November 28th—December 10th.—For the erection of a school, for the Education Committee. —Messrs. Scorer & Gamble, architects, Bank-street Chambers, Lincoln.

WELWYN.—November 28th.—For the extension of the waterworks, for the rural district council.—Mr. F. E. Tudor, 11 St. Peter's-street, St. Albans.

HARROW.—November 28th.—For the erection of a ward block at the isolation hospital, for the urban district council.—Mr. J. Bennetts, surveyor.

NORTHWICH.—November 30th.—For the erection of six houses, for the rural district council.—Mr. E. T. Ward, Brockhurst-street, Northwich.

AYLESBURY.—November 30th.—For the erection of a ward and bath-room at the isolation hospital, for the urban district council.—Mr. W. H. Taylor, engineer and surveyor, Town Hall.

HOLMFIRTH.—November 30th.—For the construction of a reservoir and laying cast-iron mains, for the urban district council.—Messrs. J. Barrowclough & Sons, engineers, Cross-roads, Holmfirth.

MANCHESTER.—December 2nd.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

ABERTILLERY.—December 2nd.—For work of school extension, for the Education Committee.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

MANCHESTER.—December 2nd.—For the construction of a retaining wall, for the gas department.—Mr. F. A. Price, superintendent, Town Hall.

NORTH RIDING.—December 4th.—For the erection of a combined cookery and handicraft room, for the Education Committee.—County Education Offices, Northallerton.

SHORTLANDS.—December 4th.—For the construction of a pumping station and contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

FARNHAM.—December 5th.—For the erection of a porter's lodge and discharging wards, for the Committee of the Farnham Joint Isolation Hospital.—112 West-street.

ARKLOW.—December 7th.—For the erection of 100 houses, for the urban district council.—Mr. L. O'Toole, Main-street, Arklow.

BARNES.—December 8th.—For building a dispensary and tuberculosis wards at the hospital, South Worple Way, for the urban district council.—Mr. G. Bruce Tomes, surveyor.

ST. THOMAS.—December 10th.—For the construction of waterworks, for the rural district council.—Mr. S. R. Lowcock, 6 Queen Anne's-gate, Westminster, S.W.

NORTHWICH.—December 10th.—For the erection of a school, for the Administrative Sub-committee of the Northwich District.—Mr. A. E. Powles, architect, 7 Winnington-street, Northwich.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

SURBITON.—For the erection of a cemetery chapel and lodge, for the urban district council.—Mr. H. W. Rantzen, architect, 8 Philpot-lane, London, E.C.

Iron and Steel.

OSWESTRY.—November 23rd.—For providing and laying 4-in. and 3-in. cast-iron mains, sluice valves, fire hydrants, and air valves, for the rural district council.—Messrs. Berrington, Son & Watney, Prudential Chambers, Wolverhampton, and 28 Victoria-street, Westminster, S.W.

ISLE OF WIGHT.—November 25th.—For supplying and fixing a conical buoy and other works at the sewer outfall, for the rural district council.—Mr. H. Eldridge Stratton, clerk, 30 Pyle-street, Newport, I.W.

BEDFORD.—December 4th.—For laying 2 miles of 4-in. and 3-in. cast-iron mains, with sluice valves and hydrants, for the rural district council.—Mr. Arthur J. Martin, 7 Victoria-street, Westminster, S.W.

BIRKENHEAD.—December 7th.—For the construction of pipe line consisting of 11¾ miles of cast-iron and steel pipes, tunnel and tanks, for the corporation. —Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

BIRKENHEAD.—December 7th.—For the supply of sluice valves, automatic valves, boxes, and gratings, for the corporation.—Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

SHEERNESS.—December 14th.—For the provision and erection of steam, exhaust, air, water, and other pipes, together with the necessary valves, and other works, for the urban district council.—Mr. F. W. Stanton, 3 Victoria-street, Westminster, S.W.

Roads.

FELIXSTOWE.—November 22nd.—For the supply of 1½-in. guage broken granite, for the urban district council.—Mr. H. Clegg, surveyor.

WEST SUFFOLK.—November 23rd.—For the supply of tar for the surface treatment of roads, for the county council.—Mr. W. Lionel Jenkins, county surveyor, Bury St. Edmunds.

BEACONSFIELD.—November 23rd.—For the supply of 1,000 tons of 2½-in. granite, for the urban district council.—Mr. H. Sargeant, surveyor.

SOUTHGATE.—November 23rd.—For private street works, for the urban district council.—Mr. C. G. Lawson, surveyor.

SHOREHAM.—November 23rd.—For the supply of 600 tons of granite, quartzite, or Elvan stone, for the urban district council.—Mr. A. W. Nye, surveyor.

EAST SUFFOLK.—November 23rd.—For the supply of tar, for the county council.—Mr. W. Jarvis, county road surveyor, County Hall, Ipswich.

PLYMOUTH.—November 23rd.—For making up a lane, for the corporation.—Mr. J. Paton, borough engineer and surveyor.

WOLVERHAMPTON.—November 23rd.—For making up certain streets, for the corporation.—Mr. G. Green, borough engineer.

SELBY.—November 24th.—For the construction of a subway road and retaining walls, for the urban district council.—Mr. R. B. McG. Gray, surveyor.

REDCAR.—November 24th.—For making up a road, for the urban district council.—Mr. J. Howcroft, surveyor.

GATESHEAD.—November 24th.—For works of paving and tar-macadamising, for the corporation.—Mr. N. P. Pattinson, borough engineer, Town Hall.

TOTTENHAM.—November 24th.—For the supply of 7,500 tons of Trinidad asphalt macadam, and 200 tons of Trinidad Lake bitumen, for the urban district council.—Mr. W. H. Prescott, engineer.

DUNDALK.—November 24th.—For concreting footpaths, for the urban district council.—Mr. M. Comerford, clerk.

BARKING TOWN.—November 24th.—For works of road widening, for the urban district council.—Mr. R. A. Lay, acting surveyor.

WHITSTABLE.—November 24th.—For the supply of 1,000 cub. yds. of picked flints, and 200 cub. yds. of hoggin, for the urban district council.—Mr. F. Laurens, surveyor.

MIDDLESBROUGH.—November 25th.—For the repaving of back streets, for the corporation.—Mr. S. E. Burgess, borough engineer.

WARWICKSHIRE.—November 25th.—For the supply of road material, broken and unbroken, for the county council.—Mr. John Willmot, county surveyor, 6 Waterloo-street, Birmingham.

ELLESMERE PORT.—November 28th.—For making up certain streets, for the urban district council.—Council Offices.

WHITLEY AND MONKSEATON.—November 30th.—For the construction of carriageway foundations, for the urban district council.—Mr. A. J. Russell, surveyor.

REIGATE.—December 1st.—For supplying and laying 14,844 yds. of creosoted wood block paving, for the corporation.—Mr. F. T. Clayton, borough surveyor.

LEWISHAM.—December 1st.—For making up a road, for the borough council.—The Borough Surveyor, Town Hall, Catford, S.E.

WEALDSTONE.—December 1st.—For the supply of granite and granite chippings, for the urban district council.—Mr. Herbert Walker, surveyor.

HOVE.—December 2nd.—For paving and other works, for the corporation.—Borough Surveyor.

BISPHAM-WITH-NORBRECK.—December 2nd.—For making up two roads, for the urban district council.—Mr. T. Harrop, engineer and surveyor, Bispham, near Blackpool.

BARTON-UPON-IRWELL.—December 5th.—For private street works, for the rural district council.—Mr. A. H. Mountain, Union Offices, Patricroft, near Manchester.

KENT.—December 5th.—For the supply of Guernsey, Jersey, or Alderney granites, Clee Hill basalt, Leicestershire granites, Penlee, St. Keverne, or other Cornish granites, Northumberland whinstone, Penmaenmawr or other Welsh granites, quartzite, Norway granite, Quenast or Lessines, 35,000 tons of tarred-macadam, 15,000 yds. of surface-picked or grubbed flints, and 5,000 yds. of Kent rag, for the Bridges and Roads Committee.—Mr. W. B. Prosser, clerk, Sessions House, Maidstone.

CAMBRIDGE.—December 7th.—For the supply of broken granite, syenite, basalt, or similar stone.—Borough Surveyor, Guildhall.

BUCKHURST HILL.—December 8.—For the supply of 140 tons of broken granite and hire of steam roller, for the urban district council.—Mr. T. J. Tee, clerk, Council Offices.

HORSHAM.—December 12th.—For the supply, in barrels of 40 gallons' capacity of about 25,000 gallons of tar, for the rural district council.—Mr. W. Dengate, surveyor, 58 Park-street, Horsham.

Sanitary.

PAIGNTON.—November 23rd.—For laying a sewer, for the urban district council.—Mr. C. O. Baines, engineer and surveyor.

PETERSFIELD.—November 25th.—For the construction of about 5 miles of pipe sewer with manholes, and sewage purification works, for the rural district council.—Messrs. Chambers, Smith & Adams, 53 Victoria-street, Westminster, S.W.

BRANDON AND BYSHOTTLES.—November 26th.—For laying a sewer, for the urban district council.—Mr. G. G. Donkin, surveyor, Langley Moor.

BARTON-UPON-IRWELL.—November 28th.—For the construction of new tanks, storm overflow, humus tanks, circular percolating filter, and other works, for the rural district council.—Mr. A. H. Mountain, surveyor, Union Offices, Green-lane, Patricroft, near Manchester.

BANBURY.—November 30th.—For the construction of sewage disposal works, for the corporation.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

ROMFORD.—November 30th.—For the construction of foul and surface water sewer and other appurtenant works, for the urban district council.—Mr. H. T. Ridge, surveyor, Council Offices.

PONTEFRACT.—December 1st.—For scavenging work in certain parishes, for the rural district council.—Assistant Overseers.

GOLCAR.—December 1st.—For the construction of main outfall sewer, internal sewers and manholes, for the urban district council.—Messrs. Lunn & Kaye, Milnsbridge, or 14 John William-street, Huddersfield.

BURTON-UPON-TRENT.—December 2nd.—For the reconstruction of about 470 yds. of 2 ft. 6 in. diameter brick and concrete sewer, for the corporation.—Mr. George T. Lynam, borough engineer and surveyor.

CHEPPING WYCOMBE.—December 2nd.—For the supply of stoneware pipes, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

CLONES.—December 3rd.—For the construction of sewage disposal works, for the urban district council.—Mr. H. J. Weaver, Northgate Mansions, Gloucester.

ALEXANDRIA.—December 8th.—For the construction of a sewerage system, for the municipality.—"M. le Président de la Commission Municipale d'Alexandrie," Alexandria.

Stores.

HENDON.—November 23rd.—For the supply of a petrol motor combination fire engine, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor, Council Offices.

NOTTINGHAM.—December 3rd—For the supply of cement, blue lias lime, red bricks, blue bricks, timber, earthenware pipes, iron castings, gullies, Yorkshire flags, kerb, granite setts, broken granite, ironstone slag, chippings, river gravel, coal, picks, shovels, scoops, ironmongery, scavenging, and other brushes, disinfectants, refined tar, pitch, and creosote oil, for the corporation.—Mr. Arthur Brown, city engineer, Guildhall.

DURHAM.—December 12th.—For the supply of cast-iron direction posts, for the county council.—County Surveyor, Shire Hall, Durham.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted

ASHTON-UNDER-LYNE.—For the extension of the sewage disposal works, for the corporation.—Mr. J. Rowbottom, engineer.

Sewage Disposal Works Reconstruction.—T. Dean & Co., Ashton-under-Lyne.

Sewerage Ironwork (Valves and Penstocks).—J. Blakeborough & Co., Brighouse.

AUCKLAND.—For providing and laying down glazed earthenware pipe sewer and manholes, for the rural district council.—Mr. C. Heslop, sanitary surveyor.

T. Manners, Bishop Auckland	£209
R. Wilson, Barnard Castle	207
Walton Brothers, Crook	197

BIRMINGHAM.—For the erection of a school, for the Education Committee:—

J. Harper & Sons, Blackheath.
T. Elvins & Sons, Birmingham.
H. H. Crump, Birmingham.
W. Moss & Sons, Limited, Loughborough, Leicestershire.
F. H. Smith, Birmingham.
J. Dolton & Sons, Blackheath.
W. Lee & Sons, Aston Manors, Limited, Birmingham.
J. Holyoak & Son, Erdington.
J. A. Turton, Birmingham.
W. & J. Webb, Birmingham.

BISHOP'S STORTFORD.—Accepted for the supply during the year of broken granite and granite chippings, for the urban district council.—Mr. R. S. Scott, engineer and surveyor.

Cliffe Hill Granite Company, Markfield, near Leicester.—1½-in. broken granite, 12s. 3d.; ½-in. granite chippings, 10s. 1d.; ⅜-in. granite chippings, 10s. 4d. per ton.

EASTBOURNE.—For private improvement works, for the corporation.—Mr. A. E. Prescott, borough surveyor.

M. Hookham, Eastbourne.—Pevensey-road and Cavendish-place, £23. Willowfield-road and East-street schools, £38. Willowfield-road, East-street, and East-street schools, £70.

A. V. McCann, Eastbourne, £25, £17, and £73.

HERTS.—For the erection of Barnet Petty Sessional Court, for the county council.—Mr. J. S. Killick, county surveyor.

Brightman & Son, Watford	£5,645
Blow & Peters, St. Albans ..	5,349
Ekins & Co., Limited, Hertford	5,110
Miskin & Son, St. Albans	5,077
E. C. Jarvis, Harpenden	5,020
Salisbury & Son, Harpenden *	4,799

HERTS.—For the erection of Stevenage Petty Sessional Court. Mr. J. S. Killick, county surveyor:

Cummack & Sons, Stevenage, Bishop's Stortford	18,293
Lawrence & Partner, Letchworth	7,855
Gosman & Son, Hertford	6,645
Baines & Co., Hitchin	6,[illegible]
Isaac & Powell, St. Albans	6,[illegible]
Lawes & Co., Limited, Hertford	6,[illegible]
Sculthorpe & Son, Hertford	6,[illegible]
Prestwood & Son, Watford	6,[illegible]
Mason & Son, St. Albans	6,184
F. Newton, Hitchin* ..	6,[illegible]

HERTS.—For the erection of new education offices, Hertford. Mr. J. S. Killick, county surveyor:

G. T. Greenwood, Mount Hawkins	£[illegible]
W. J. Prestwood, Harpenden	[illegible]
Fox & Son, Bishop's Stortford	4,319
Fox & Son, Hertford	[illegible]
Nash & Son, Hertford	[illegible]
Cummack & Sons, Limited, St. Albans	[illegible]
Prestwood & Son, Watford	[illegible]
Lawes & Co., Limited, Hertford	[illegible]
Sculthorpe & Son, Hertford	[illegible]
F. Newton, Hitchin* ..	[illegible]
Hodgson & Co., Ltd., for erection of separate offices, including heating apparatus. Mr. C. H. Dickson, consulting engineer:	
J. Lowe, Stevenage	£[illegible]
C. H. Dickinson, Stevenage	[illegible]

HERTS.—For the erection of Letchworth Police Station. Mr. J. S. Killick, county surveyor:

Lawes & Co., Hertford	£[illegible]
Cockle & Turner, Letchworth	[illegible]
Gosman & Son, Ware	[illegible]
Brackman & Sons, Watford	3,911
Salisbury & Son, Harpenden	[illegible]
First Garden City, Limited, Letchworth	3,781
Souster & Son, Letchworth*	3,[illegible]

HOLYWOOD (Ireland).—For work of improvement for the urban district council:—

J. Preston & Son, Newtownards	[illegible]
R. & J. Pearce, Belfast ..	[illegible]
[illegible], Belfast	[illegible]
J. Ross & Son, Belfast ..	[illegible]
J. J. McCullen, Belfast	[illegible]
S. R. Boyd, Belfast	[illegible]
Workman, Limited, Belfast	[illegible]

LEEDS.—For the erection of a [illegible] for the corporation. Mr. W. T. Lancaster, city engineer:

W. Simpson, Boulder, Leeds, £[illegible]

PRESTON.—For the erection of a cottage, for the Joint Hospital District.—Mr. W. D. T. Munford, architect:—

J. Kay & Son, Longridge, near Preston	[illegible]
J. Cottam, Preston	[illegible]
Rimmer & Walker, Preston	439
J. Cartwell & Sons, Limited, Preston	425
[illegible]	[illegible]

RAWMARSH.—Accepted for making up a street, for the urban district council.—Mr. J. A. Tonge, surveyor:—

Lane Brothers, Mansfield, £183.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

NOVEMBER.

20.—Institution of Mechanical Engineers: Mr. G. Gerald Stoney, [illegible] on the Effect of Vacuum on Steam Turbines.

26.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham.

27.—Junior Institution of Engineers: Mr. C. F. [illegible] on A Model Drawing Office System [illegible] Victoria Street, S.W.

28.—Institution of Municipal Engineers: Annual General Meeting in London.

DECEMBER.

[illegible] Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of appointments. Such advertisements may, in cases of emergency only, be telephoned (City No. 1896) subject to later confirmation by letter.*

TEMPORARY ASSISTANTS.

The Temporary Assistant [illegible] of [illegible] required in Northern [illegible], preferably with some experience of Bridges and Private Street Work. [illegible] Salary, £[illegible] per annum.—Box 1,186, Office of THE SURVEYOR, 21 Bridge Lane, Fleet Street, E.C. [illegible]

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Your enquiries for DUST and CORN Bins, Manhole Dirt Boxes, Skips, Buckets and every description of Galvanised Holloware should be sent to:—

HILL & BOALER,

Holloware Manufacturers,

LYE, STOURBRIDGE.

Contractors to His Majesty's Government.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

The Science of Water Purification.

Very few people have any proper idea of the importance of the great advances made in the science of water purification during the last few years. Water purification is generally regarded as the means whereby the good quality of drinking water may be ensured. For instance, organic and inorganic matters in suspension may be removed by filtration, or even bacterial impurities may be got rid of; or, again, hard water may be softened. However, the average layman will generally state his preference for obtaining a water pure at its source, and if he can only find some obliging chemist or medical officer who will tell him that this is so he will give his support whole-heartedly to the proposal which has for its object the attainment of this ideal. To such a person, and, indeed, to all water engineers or others interested in the subject of water supplies, we commend a recently published book by Dr. Samuel Rideal and Dr. Eric K. Rideal dealing with "Water Supplies: Their Purification, Filtration and Sterilisation."* It will be seen that the whole question of water supply is affected by the scientific progress made within a few years. Water differs in quality in every case; the character of the ground in which it falls, the earth or rock through which it percolates, and the channels through which it flows either above or below ground, and even the quality of the atmosphere through which the rain falls, each and all tend to affect the quality of water. Then there are the effects of animal and vegetable life present on the surface of the earth, in lakes and in rivers, to be taken into consideration. The result is that water to all appearance of the purest quality may be of a character to corrode mains, clog them with deposits of lime or other material, cause lead poisoning, and produce animal or vegetable growths inside pipes, sometimes resulting in unpleasant tastes and odours.

To enumerate the possibilities of trouble due to water is outside the scope of the present note, but in order to indicate them we have given the above instances, to which may be added the iron rust trouble, or red water plague, as it is called in America. Even the waters obtained from the purest upland sources may need treatment. Reference to the troubles experienced with some of our greatest supplies of this character prove the point. Most waters attack iron pipes more or less rapidly. It does not require any great mental effort to grasp the fact that it is worth while to treat the water before use in order to remove the corrosive qualities. It is not only very desirable, but it is very economical to do so. Waters derived from moorlands are often plumbo-solvent; common sense tells us first that such waters should be carefully examined, and next that they should be treated so as to get rid of the plumbo-solvent quality. Obstructions caused by incrustations in mains are entirely due to the quality of the water; they may be animal, vegetable, or mineral, but they may be prevented by suitable treatment. If such treatment is not given the mains lose their carrying capacity, and much greater expense is ultimately caused than could possibly be incurred by the simple treatment needed to prevent the possibility of incrustation.

Much more might be said to prove the value and importance of water treatment. Water should be regarded as a manufactured product. If it possesses any harmful quality, this can certainly be removed. If pipes corrode, do not blame the pipes, which are probably good—blame the water. If boilers become coated with scale, if there is trouble with rust, if the bacterial quality of the water is below the highest standard, it should be remembered that all these things are curable; moreover, it should be understood that there is probably no water drawn from a natural source which is altogether free from qualities which cause actual financial loss, and that it will generally prove to be sound finance to deal with the matter scientifically. In these days it is clearly folly and extravagance to use water which possesses any undesirable quality. A study of the book referred to above will show that where such troubles are dealt with scientifically it is always possible to remove them. The new publication will certainly take its place among the best works of reference.

* London: Crosby Lockwood & Son. Price 7s. 6d. nett.

The Concrete Institute.

The members of the Concrete Institute are to be congratulated on having as their new president so experienced an engineer as Prof. Henry Adams, whose capacity to deal with a wide range of subjects affecting the interests of structural engineers was amply demonstrated in the inaugural address which he delivered on Thursday of last week. In the course of his remarks on the domestic affairs of the institute Prof. Adams drew attention to the inauguration of a series of informal meetings for the junior members, who are perhaps too diffident to join in the discussions at the ordinary meetings—an idea which might well be copied or adapted by some other societies. Turning to topics of wider interest, Prof. Adams first discussed the official "Regulations for the Use of Reinforced Concrete" in London, and criticised the inclusion therein of specific formulæ by which the desired results are to be obtained. He spoke next of the value of the lessons which may be learned by an intelligent study of failures; and although the "Investigation Committee" appointed by the institute has not hitherto been able to do much useful work, it is to be hoped that the new president's wise words may lead members to supply in confidence details of failures, so that the engineers of the future may profit by the experience of the past. The important work of standardisation has been carried on by the

institute in two directions, namely, by the appointment of a Joint Committee with the Quantity Surveyors' Association for preparing a standard system of measurement, and by the preparation of a standard specification for reinforced concrete—a task which is nearing completion.

It was perhaps only to be expected that the address under notice should contain a reference to the usual method followed for obtaining designs for the structural parts of a reinforced concrete building. The common system of competitive design is certainly open to objection, and we agree with Prof. Adams' view that collaboration between the architect and the structural engineer is the preferable course, so that a single design may be prepared upon which contractors may tender on a common basis. This raises the question as to what are the real functions of the "structural engineer." The reply to this is that he is concerned with the design of those parts of a building or other structure, of reinforced concrete or any other material, the chief object of which is stability, and that in regard to these matters he is in the nature of a consultant specialist. The last matter to which we desire to refer is the reactionary policy pursued by the Local Government Board in regard to the period for which they are prepared to sanction loans for works of reinforced concrete. The present periods allowed are so short that, although the actual cost of reinforced concrete is very much cheaper than that of mass concrete for the same work, the annual sum for the repayment of loan and interest is considerably greater. This fact, naturally, has a tremendous retarding effect upon the progress of reinforced concrete in this country, and it is to be hoped that the board may soon be induced to proceed on more enlightened and modern lines.

* * *

Municipal Progress in Calcutta.

We learn from a summary of the report of the municipal administration of Calcutta for the year 1913-14, which appears in *Indian Engineering*, that the change of the capital of India has not had the disastrous effect on municipal finance that was expected in some quarters. On the contrary, prosperity in Calcutta "has been abounding." The receipts of the corporation are stated to be large, and the credit balance considerable—it was much higher than for the four previous years—while it is also placed on record that no loans were raised during the year, a fact at once gratifying and suggestive, provided always that nothing has been left undone which ought to have been done. That this latter condition would seem to have been fulfilled is to be surmised from the statement that the municipality had embarked "on a most liberal scheme of improvements." In the surveyor's department, writes our contemporary, projects chiefly relating to street improvements were drawn up, aggregating in value over £1,600,000. The operations included land acquisitions of considerable value, the most important being in connection with the proposed new municipal market, the Kalighat improvement scheme, and the scheme for widening and improving Ballygunge circular road. The removal of huts has been effected upon an extensive scale, spaces cleared between huts, passages opened, roads and surface drainage constructed, while other works have comprised sewering, kerbing and channelling, the provision of connected privies and common latrines, and the construction of three new bathing platforms. Many of these works, of course, belong to the ordinary activities of municipal administration, but collectively they would appear to form a desirable and necessary chapter in the historical progress of Calcutta, and as such are welcomed and appreciated.

It appears that the water supply of the city has been the subject of criticism, but this can hardly have been directed against the volume of water which is available. This can hardly be said to be other than liberal, if not extravagant. The inhabitants are stated to be consuming 32·8 gallons of filtered water, and 25·4 gallons of unfiltered water per head per day, a total of a little under 60 gallons of pumped water. It is suggested that a good deal of water is wasted because it is not charged for direct; but, however this may be, it is to be accepted as a good sign that the municipality can afford to provide water in such abundance without feeling the pinch as others might in like circumstances. Improved schemes for sewage treatment and lighting are also dealt with in the report, and *Indian Engineering*, not without sufficient reason, draws the conclusion from the contents of this document that there has been a remarkable awakening in the Calcutta Municipality, thanks to "an honest intention to progress by Western methods."

* * *

Fire Prevention Committee and the War.

Like many other technical and scientific institutions, the British Fire Prevention Committee has been largely engaged during the past three months on work connected with the war emergency. In the first place, its well-known series of "Fire Warnings" has been extended to meet the special circumstances of the present time, and the distribution, at the request of the authorities, of one "Warning," dealing with the necessary fire precautions in military hospitals, alone exceeds 10,000 up to the present time. Abbreviated French and Flemish translations are provided in the form of short notices for Belgian wounded. In order to meet the fire danger resultant from the great influx of refugees, many of whom were not conversant either with the English open fire, gas lighting, or electricity, a special "Warning" was issued for refugee homes and hostels, and this was also published in French and Flemish. Here, again, considerable issues are being made on the requirements of the authorities—one public department absorbing no fewer than 5,000 copies. In all the committee's "Warnings" the results of the committee's experience and experiments have been embodied in concise language, and should be of infinite benefit to the many users.

The British Fire Prevention Committee, having a number of distinguished surveyors among its membership and subscribers, also organised a special fire survey force, which is doing a considerable amount of survey work in connection with Government establishments, and particularly in connection with hospitals for the wounded. The force comprises some seventy fire surveyors, and it is interesting to note that the two seniors of the fire surveyors are Mr. Leslie Vigers, past-president of the Surveyor's Institution, and Mr. Geo. T. Bullock, past-president of the Junior Institution of Engineers. Further, in order to meet the emergency of the depletion of actual fire brigade and watching staffs, a special fire service was formed, with the Earl of Londesborough as honorary commandant. This comprises 300 fire brigade officers, patrolmen and firemen, divided into sections available for mobilisation at forty-eight hours' notice, and some of the sections can be equipped with steam fire engines lent by large estate owners. Besides this, the committee has also formed a technical inquiry office, to which the Government departments, local authorities, and other corporations bring many questions and inquiries to be dealt with, and by a system of decentralisation most of these technical inquiries can be dealt with in forty-eight hours. Since the outbreak of war four "Red Books" embodying the results of tests have been issued, and three further ones are in the press. It will thus be seen that the committee is devoting the results of its experience very largely to national

Improved Horseshoes.

[illegible] able to withstand the peculiar destructive effects of the resilient pneumatic tyre, but must at the [illegible] duction of dust which will prove a nuisance to other users of the road and the occupants of neighbouring houses and shops. Considerable success in achieving these results has been attained in country districts by the employment of a tarry, bituminous, or other similar material in the construction of macadam roads. The success of this type of surface, however, depends largely upon its power to resist the penetration of water, and in order that this power may be retained it is important that the surface shall remain smooth and unbroken. This fact has hitherto placed the road engineer in a dilemma. Either the surface remains smooth, in which case horses have great difficulty in retaining their foothold, or calkins or other projections are fitted into the shoes of the horses, which damage the road surfaces and render them no longer waterproof. Realising these facts, the Roads Improvement Association, which exists to promote the improvement of roads to the satisfaction of all classes of traffic and to assist traffic to adapt itself to the new conditions, recently organised a competition for a new or improved type of horseshoe. The *personnel* of the Committee of Judges was such as to inspire the greatest confidence, and over 880 entries were received. The judges' report will be found in another column, and although on the whole the competition may be accounted a success, it is worthy of note that no shoe or device entered was of sufficient merit to warrant their awarding the first prize of £100. Moreover, of the three premiums awarded, the report states that neither of the first two is based upon any new idea, the appliance in each case consisting of an improved method of adapting an old device. It is satisfactory to observe, however, that, although entries were received from ten countries, all of the awards go to English firms, who are to be congratulated on their success. The task of the judges has not been a light one, as since the beginning of the year they have been engaged in examining and testing in a practical manner the various devices submitted.

* * *

By-laws and Timber.

The value of a paper which was read yesterday before the Institution of Municipal and County Engineers at Birmingham by Mr. E. J. Goodacre, the assistant borough surveyor of Shrewsbury, was enhanced by reason of the fact that the author took a narrow subject and dealt with it thoroughly. Although many new building materials have come into use in recent years, there is as yet little likelihood of timber being superseded, and the question of its relation to the building by-laws is one of considerable importance. Mr. Goodacre's criticism was of two kinds. In the first place, he brought a very keen and practical observation to bear upon the actual provisions of the by-laws, and in the second place he called attention to some notable omissions. Perhaps the most important part of the paper was that which dealt with the prevalence of dry rot. Mr. Goodacre has paid a good deal of personal attention to this subject, and the account he gave of the experiments which he has recently carried out was of much interest. Moreover, he appears to have established his proposition that the provisions of the by-laws as to the ventilation of floors are quite inadequate as an effectual preventive. Quoting from a circular issued by the Board of Agriculture in 1909, he pointed out that the infection of timber with dry rot fungus sometimes takes place in the forest, when felled timber remains stored there for any length of time. Moreover, the fungus is by no means rare in old beams and boards stored in woodyards, and it is mainly from such causes that spores or portions of the spreading mycelium are introduced into buildings by new wood which has become infected. Mr. Goodacre's comment that the information given by the Board of Agriculture does not seem to have impressed their neighbours at the Local Government Board is very apposite, and in this respect the Model By-laws certainly require strengthening. We concur in the hope that in this and other matters the Local Government Board will eventually bring their by-laws more into line with modern opinion and experience.

Improvised Hospitals.

[illegible] Government for the war "which has been forced upon them" that it is said that for many years past even their elementary schools have been designed with a view to their easy conversion into hospitals. So far as Great Britain is concerned, however, in this, as in so many other respects, more or less hastily devised emergency measures have to take the place of prearranged and well-thought-out schemes. Thus it is that at the present moment large numbers of public and private buildings are being converted as speedily and efficiently as possible into Red Cross hospitals, and in not a few instances the municipal engineer suddenly finds himself at work as a Red Cross architect. We are confident that such services are in every case given in the most willing and ungrudging spirit, and with a view to assisting those who are so engaged we publish in another column an article on the subject from the pen of Mr. G. Bertram Hartfree, the engineer and surveyor to the Alton, Hants, Urban District Council. It must, of course, be fully realised that the precise planning and equipment will depend entirely upon local conditions and the intended use of the hospital. Nevertheless, the very practical hints given by Mr. Hartfree in regard to such matters as establishment accommodation, sanitary fittings, and emergency cooking arrangements can hardly fail to be of value, while the examples of conversion of which illustrations are given will well repay study.

* * *

Sewage Works Managers.

The resignation of Mr. Charles Ball from the honorary secretarship of the Association of Managers of Sewage Disposal Works, owing to the increasing growth of the work of the association and to the pressure of other duties, is an event which must not be allowed to pass without notice. Mr. Ball has held this office since the inauguration of the association in 1901, and the success of the association is due in no small measure to the zeal and ability with which he has discharged his duties. The annual meeting will be held in London on December 10th, when the opportunity will be taken of presenting the retiring secretary with a tangible evidence of the appreciation of the members in the shape of an illuminated address. Mr. Ball is succeeded by Mr. J. B. Croll, of the Richmond main drainage works, an appointment which will give general satisfaction. It is gratifying, too, to know that the association will not entirely lose the benefit of Mr. Ball's unique experience of their work, as he has consented to continue to deal with its financial affairs. Meanwhile, it is announced that, in view of the present disturbed state of public affairs, the annual dinner of the association will not be held this year.

Timber and its Relation to the Building By-Laws.*

By E. J. GOODACRE, [illegible], Assistant Borough Surveyor, Shrewsbury.

Timber, the first and foremost building material used in the prehistoric dwellings of our ancestors, is still a valuable commodity to the engineer and builder. Although the progress of building science has brought new constructive materials into vogue, wood continues to hold a prominent position in the engineering and building world.

The author has always been very much surprised at the sparse treatment that timber receives in the by-laws adopted by urban authorities, and it is proposed in this paper to briefly review the different clauses appertaining to this material, criticising and formulating suggestions for discussion, with the hope of exchanging ideas on the subject to mutual advantage, and thus strengthening surveyors in the exacting and responsible duty of ensuring the public safe and hygienic dwellings. Many of our largest towns, by means of local Acts, have more powers in this respect than small local authorities, and they have consequently framed stringent by-laws accordingly; but surely the homes of our citizens in small towns and villages need similar protective powers under the Model By-laws.

The most recent draft urban Model By-laws have been taken as the basis of this criticism.

INADEQUACY OF BY-LAWS.

Bearing of Wood Bressummers.—By-law 34 states: "Every person who shall erect a new building shall cause every bressummer to be borne by a sufficient template of stone, iron, terra-cotta, or vitrified stoneware of the full breadth of the bressummer, and to have a bearing in the direction of its length of 4 in. at least in each end."

The latter part of this by-law, quite sound in its intention, has to some extent been defeated by the wiles of the jerry-builder, in his policy of cutting down expense and timber at the same time, by means of the common practice of cutting the deals forming the bressummer on the splay. The bressummer certainly has a bearing of 4 in. in the direction of its length, but not in the direction of its depth. Floor joists are similarly treated in this objectionable manner, and the by-laws should receive amendment to enable this to be stopped.

Timber Fixed near Flues.—By-law 47 states: "A person who shall erect a new building shall not place any timber or woodwork—

(*a*) In any wall or chimney breast of such a building nearer than 9 in. to the inside of any flue or chimney opening;

(*b*) Under any chimney opening of such building within 10 in. from the upper surface of the hearth thereof. A person who shall erect a new building shall not drive any wooden plug into any wall or chimney breast of such building nearer than 6 in. to the inside of any flue or chimney opening."

This by-law, perhaps generally imagined to be not of great import, is one of the building edicts which is contravened more than any other, and, in fact, is one which requires almost constant supervision to enforce it.

In a large town, or, in fact, any town where the building trade is brisk, it would require a small army of building inspectors to watch the speculative builder, or there will be, most probably, a breach of this by-law in the fixing of skirtings, picture rails, or angle beads to chimney breasts. It is, no doubt, an arbitrary point as to which method is the best to fix these mouldings without using wooden plugs in the "danger zone" of the flues.

It is noticeable that in many of the by-laws the remedy is specified to "what shall not be done," and in this case, where some solution would be of value, none is given.

Lead plugs and breeze bricks are methods sometimes adopted, but lead has been known to melt and its object thus defeated; breeze bricks are almost certain to be in the wrong place, or cannot be found by the carpenter when he comes on the scene after the walls are plastered.

The best solution to the difficulty is, undoubtedly, the use of fireclay piping at least 1 in. in thickness in all flues. Although slightly more costly, it would save the cost of parging the flues—a constant source of worry to the inspector—and all risk of firing wooden fixings would be reduced to a minimum, and incidentally there would be fewer smoky chimneys.

Ventilation of Floors.—By-law 55 states: "Every person who shall erect a new domestic building shall so construct every room which shall be situated in the lowest story of such building, and shall be provided with a boarded floor, that there shall be, for the purpose of ventilation between the underside of every joist on which such floor may be laid and the upper surface of the asphalt or concrete with which, in pursuance of the by-law in that behalf, the ground surface or site of such building may be covered, a clear space of 3 in. at the least in every part, and he shall cause such space to be thoroughly ventilated by means of suitable and sufficient air bricks, or by some other effectual method.

"Provided that the foregoing requirement shall not apply in the case of a room provided with a solid floor composed of boards, planks or wood blocks, laid or bedded directly upon concrete or other similar dry and impervious foundation."

The ravages of dry rot in floor timbers are well known to every municipal engineer, and this by-law to some extent safeguards against this virulent disease.

The author has paid a good deal of attention to dry rot, and has recently carried out several interesting experiments in order to glean information on this subject.

Small pieces of well-seasoned red deal, pitch-pine, oak, teak and mahogany were inoculated with the disease, and the specimens placed in a dark chamber with a congenial, warm, stagnant atmosphere.

The red deal, as might be supposed, was the first to show signs of germination, and in three days a white mould broke out in round patches, especially at the exposed end of the piece, looking like cotton-wool. This outgrowth became more dense, and gradually evolved into a dark-brown snuff-like powder.

Teak and mahogany showed similar signs, but in a lesser degree.

Oak showed only the faintest signs of susceptibility to the attack at the outset.

Pitch-pine warded off germination for a considerably longer period, possibly owing to the resinous nature of its fibres.

The foregoing specimens were well seasoned, but still they were not immune from attack in congenial surroundings, and this is important.

In comparison with the above results, a piece of unseasoned red deal which already showed the first signs of dry rot—viz., reddish-brown stains and small rustlike patches—was submitted to a similar experiment, and, needless to say, the *Merulius lachrymans* developed very quickly. In the first few days the deal was permeated with the growth. The wood at first became discoloured to a dark-brown colour; it then swelled as the cell walls absorbed moisture in the direction of the fibres. It afterwards gave up this moisture, and eventually "charred." It became lighter in weight, and crumbled up into a brown powder when probed with a knife.

It is thus evident how timbers infected with dry rot lose all their strength and become unsafe, and it is only to be expected to find a by-law dealing with this matter. But does this by-law go far enough? Many cases, no doubt, will occur to all where dry rot has shown itself, even though the by-law has been literally observed.

In fact, the Board of Agriculture and Fisheries, referring to the increasing prevalence of the disease, drew up an official leaflet in 1909, of which the following is an extract: "Infection with dry rot fungus sometimes takes place in the forest, when felled timber remains stored there for some time.

"The first evidence of such infection is indicated by the presence of red stripes in the sawn wood. If such wood is thoroughly seasoned, the mycelium present in the red wood is killed. If the seasoning is neglected or imperfectly done, the mycelium, which

* Paper read at a meeting of the West Midland District of the Institution of Municipal and County Engineers at Birmingham yesterday.

possesses the power of remaining in a latent condition for some time, continuing active growth when the wood is used in any part of a building where it is exposed to dampness, and this in some cases is not noticed for years, when the ends of joists are built into a wall.

Under such circumstances dry rot eventually appears.

"On the other hand, the danger is by no means rare in old beams, and boards stored in wood yards, &c., and it is mainly from such causes that spores or portions of the spreading mycelium are introduced into buildings by new wood which has become infected.

"Spores are diffused by currents of air, or by rats, mice and insects.

"The mycelium can extend over stones and other such substances."

The author has recently inspected a very bad case of dry rot, in which the mycelium has spread over glass and along a wall to a door casing, which had become so decayed that the hinges had fallen out. . . .

It is quite evident that the information given by the Board of Agriculture has not vividly impressed their neighbours at the Local Government Board offices, as there has been no amendment in the by-law for the last twenty years or so. Possibly it is thought that the by-law quoted is sufficient, and that the person in charge of the administration of the by-laws is a sinbeent "weapon" to hold the "rampart enemy." If such is the case, it will be necessary for the municipal engineer to bring to his aid "the unwritten law"—bluff—to bear upon the builders, if he is to ensure the houses built under his supervision being free from dry rot and remaining so.

The following points are suggested as essential to this end, and probably others will be forthcoming in the course of the discussion.

The timber must be well seasoned, and must be kept dry. The dampcourse to external walls and sleeper walls must be absolutely impervious. The site should be covered with at least 4 in. of cement concrete, consisting of 1 part of Portland cement, 1 part of sand, and 4 parts of clean broken brick, granite, or ballast.

Particular stress is laid upon this, as Model By-laws use the rather elastic term "good cement concrete," and the author has heard the speculative builder argue that this is satisfied with concrete made something like the following: "One bag of cement to a cartload of dirty engine ashes." Of course, this is absolutely useless.

Ammoniacal exhalations generated from vegetable soil are favourable to the disease spores, and therefore all soil should be entirely removed from underneath all floors.

The house should be well dried before the floors are laid, and the floor boards should on no account be laid in a wet state.

The ventilation under floors should be most efficient. Ventilating air bricks in the external wall are not sufficient, but should be supplemented by air drains under all adjacent solid floors. Even then it is very doubtful whether ventilation actually exists, and the only remedy appears to have an air flue from the under floor space carried up with the smoke flue of the room.

Chips of wood left by the carpenters, lying about under the floors, are frequently the origin of an attack of dry rot in floors, and they should therefore be cleared up. Even with concrete under floors this is essential, as the shavings probably become infected with dry rot before the concrete is dry.

The ends of the joists should have a clear air space around and should not be bedded in lime mortar, for the moisture of the mortar is absorbed by capillary attraction into the joist; moreover, quicklime, unless kept quite dry, has an injurious effect on wood, and it is always present to some extent in fresh mortar.

The skirting should be backed with adamant plaster, and should not be fixed until the wall and plaster are quite dry.

Windows to Open.—By-law 56 states—"Every person who shall erect a new building shall construct in every habitable room of such building one window at the least opening directly into the external air, and he shall cause the total area of such window, or if there be more than one, of the several windows, clear of the sash frames, to be equal at the least to one-tenth of the floor area of such room.

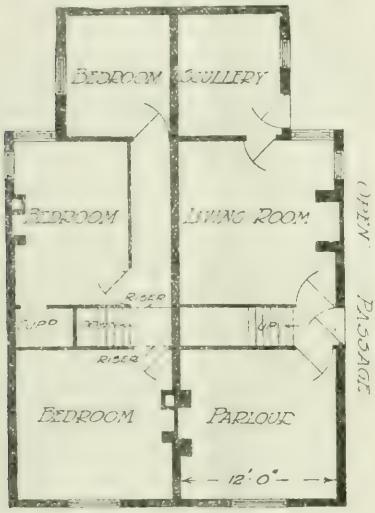
"Such person shall also construct every such window so that one-half at the least may be opened, and so that the opening may extend in every case to the top of the window."

"Habitable room" in this by-law, as in others, is somewhat vague, and the board should have defined it in the interpretation of terms. Apparently, also, one might build a pantry or larder without a window and yet satisfy this by-law.

Another point in this by-law is rather arbitrary—that is, one half may be opened—one half of what? The whole window area or one-twentieth of the floor area? Presumably the latter; but at all events such ambiguity is a constant source of worry to the administrator of the by-laws.

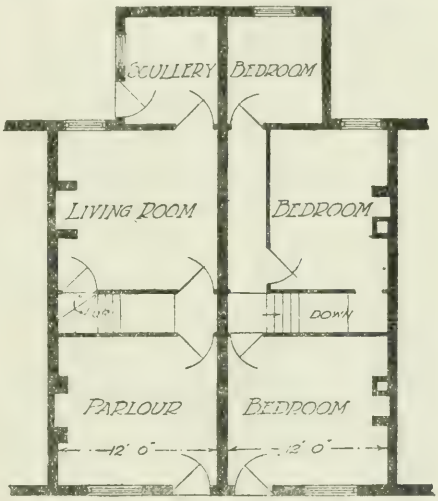
NOTABLE OMISSIONS FROM THE BY-LAWS.

There are several notable omissions from the Draft Model By-laws regarding woodwork. The author, as stated previously, is fully aware that this does not apply to all by-laws adopted by local authorities, but the questions involved are so vital to the safety



Bedroom Plan. Ground Plan.

FIG. 1.



Ground Plan. Bedroom Plan.

FIG. 2.

[illegible] every local authority.

[illegible] narrow-fronted semi-detached house, such as Fig. 1.

The author has frequently had occasion to cause the builder to alter the stairs, in order to give a sufficient headroom.

In some cases this has been quite unsafe, and, not having any statutory powers, the only way the surveyor can accomplish this necessary alteration is by tact.

[illegible] stairs, risers immediately at the threshold of bed- [illegible] staircases, especially in the case of stairs approached from the living-room and shut off by a door, as shown in Fig. 2, are a few points for objection.

To meet these objections by-laws should be framed embodying the following points:—

(1) The angle of the string of the stairs should not exceed 45 degrees with the floor. This would approxi- [illegible] lecting the nosing.

(2) [illegible] 6 ft. 6 in., measured vertically.

(3) Winders, if absolutely necessary, should be at the bottom of a flight of stairs, and not at the top.

(4) No riser should be permissible immediately under a door.

(5) Every staircase should be provided with a proper banister, handrail or balustrade, of a height of not less than 2 ft. 6 in., measured vertically from each tread, and properly and securely fixed.

(6) The staircase should be properly lighted, and should be not less than 2 ft. 9 in. in width.

Strength of Floor Joists and Roof Timbers.—In the author's opinion no by-laws can be deemed complete unless every surveyor has actual power to regulate the safety of floors and roofs.

Numerous cases will no doubt rise in the minds of council officials of floor joists of unsound timber and doubtful scantling, fixed at excessive centres in houses under their jurisdiction.

There is a difficulty in providing for the many and various cases of public buildings and warehouses, but surely necessary powers might be left to the discretion of the municipal engineer, who is quite competent to deal with such questions; if he is not, then the Local Government Board should sanction the appointment of competent officials, not only to satisfy themselves, but to justify the status of the engineer—*en passant*, a step for which our institution has always striven, and will no doubt always strive, until it is an accomplished fact.

The question, however, of the soundness and scantling of timbers for floors and roofs in domestic buildings is a more definite quantity, and these should be tabulated for various bearings at fixed centres, with strutting at fixed intervals.

The foregoing remarks are the result of the author's personal experience, but are set forth in the hope of creating discussion, in which members of the institution will add their experience in the administration of the by-laws under difficulties undoubtedly existing under present conditions. The present-day agitation for cheap dwellings is, of course, a great factor to be considered; but surely this can and must be effected without sacrificing the safety and hygienic conditions of dwelling-houses. In conclusion, the author is not without hope that, with constant pressure and perseverance, the Local Government Board will eventually bring their by-laws more into line with the trend of opinion and experience of those whose duty it is to administer them.

An Old Controversy Ended.—Last week the seal of the Foleshill Urban District Council was affixed to an agreement with the Warwickshire County Council, the Bulkington Urban District Council, and the Coventry Canal Company in respect of the reconstruction of a dangerous canal bridge on the main road between Bedworth and Bulkington. The work is to cost £1,100 (approximately), and the Foleshill Council agreed to contribute £200 on behalf of Bedworth. The question of this work has been before the local and county authorities for no less than ten years.

HORSESHOE COMPETITION.

JUDGES' AWARDS AND REPORT.

[illegible] conjunction with the Royal Society for the Prevention of Cruelty to Animals, have now been issued. Although over 850 shoes from all parts of the world were submitted for competition, the judges state that no shoe or device entered was of sufficient merit to warrant them awarding the prize of £100. The judges, however, have granted premiums to three entrants.

Mr. P. B. Gray, of the Gray Horseshoe Pad Company, The Hill, Sutton Coldfield, is awarded £21 for his rubber frog pad. This appliance consists of a rubber pad placed between the heels of the shoe, over the frog, and is held in position by a thin strip of steel let into the foot surface of the shoe at each end. This is not a new idea, but its advantage over other types of pads is that the whole of the sole is left uncovered, whereas in most other cases it is completely covered by rubber or leather. This reduces the amount of material used in the construction of the pad to a minimum, and enables it to be supplied at a low cost compared with other rubber pads. The shoes required for these pads are the ordinary flat pattern, and are made in the usual manner.

A second premium of £15 15s. is awarded to Messrs. Joseph and George Deighton, of Central Shoeing Forge, Harrogate, for their channelled shoe filled with tarred rope. This idea is also by no means new, but the advantage which the entrants claim over other types of shoes is that it can be made quite easily by hand from the bar. The nails go through the rope, this preventing it dropping out; but this method of application may cause injury to the foot, owing to the difficulty of adjusting the pitch of the nail. In previous types of rope shoes the rope had to be fitted after the shoe had been nailed on, and the shoe itself was usually of cast-iron, which prevented satisfactory fitting. The price at which these shoes can be supplied is slightly higher than the ordinary shoe, and its wearing qualities are quite satisfactory. This shoe would have taken a higher position in the opinion of the judges had it not been accompanied by the difficulty of application.

Mr. Thomas Delves, of Harrogate, is awarded £10 10s. for his flat shoe for bringing the horse's frog into action. The judges are of opinion that this was the best shoe of its particular type, and if used on feet with good frogs would bring the frog into action in a suitable manner, and be one of the best means of preventing slipping, and cause the minimum of damage to the roads. This shoe was not practically tested, as the committee were satisfied as to its utility, given a good frog, without a trial.

The competition was opened March, 1913, and closed December 31st last. Entries were received from the United States, Canada, South Africa, Australia, China, Germany, France, Holland, Sweden, and all parts of the United Kingdom. Since the commencement of the year the Judges' Committee have been engaged in examining and testing in a practical manner the various devices submitted. The shoes were tested upon varied types of horses working in different parts of the country, and it is only after very exhaustive experiments that the judges have made their awards as above.

Copies of the judges' awards and report can be obtained from the secretary to the Roads Improvement Association, Mr. Wallace E. Riche, 15 Dartmouth-street, Westminster, London, S.W., price 2d., post free.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Coventry Town Planning Scheme.—Coventry City Council have given notice of their intention to apply to the Local Government Board for authority to prepare a town planning scheme, a portion of the land for which is situated in the parish of Foleshill, in the district known as Lythall's-lane, near the, London and North-Western Railway.

The Adaptation of Public Buildings as Red Cross Hospitals.

By G. BERTRAM HARTFREE, F.S.I., Engineer and Surveyor to the Alton, Hants, Urban District Council.

Press reports state that for many years German elementary schools have been designed to allow their easy conversion into hospitals. This infers that the nation expected war; but the majority of the British people had not reached such a state of expectation, and consequently have no buildings expressly intended other than for their original purpose. Nevertheless, many buildings can, at comparatively small expense and short notice, be converted into suitable hospitals.

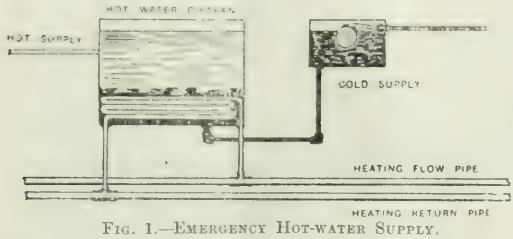


Fig. 1.—Emergency Hot-water Supply.

It may be useful at this stage to review the work of the various medical units from the firing line to the hospital at home, whether in large town or village. The rear of the battle line may be taken as consisting of collecting zones in which the wounded are treated by first aid, and removed to the field hospitals, which consist of buildings, tents, or whatever shelter can be obtained. After treatment here they pass through the transmitting areas to a centre for distribution. From this station, by rail or sea, they are conveyed to the general hospitals at base, and in accordance with their condition or the accommodation of the hospitals, they may be subsequently removed to the relief hospitals in the villages or the country towns.

It is here that the services of the municipal engineer may be requisitioned as a Red Cross architect. A minimum floor area of 6 ft. by 8 ft., and an air space of 500 cub. ft. is advised by several authorities, but whenever possible a minimum of 1,000 cub. ft. should be adopted. Difference of opinion exists as to advantages or otherwise of single large wards as against a number of small rooms. Large halls have the advantage that administration and supervision can be carried out far better, but several small rooms are of advantage for cases that need quiet, or isolation should infectious disease be suspected.

Local conditions and the intended use of the hospital govern the number and sizes of the various establishment rooms, which include the following:—

Commandant's office, nursing superintendent's office, doctor's office, pharmacist's office, quartermaster's store and office, ammunition store, receiving-room, operating theatre, nurses' offices and day-rooms, laundry, mortuary, rooms for staff, kitchen and scullery.

The commandant's office must be in a central position. Should the Red Cross Hospital be administered by the nursing heads of a local hospital, possibly a special room for the nursing superintendent is not imperative, although undoubtedly this is desirable in the interests of systematic administration. The quartermaster's store requires a sufficiency of cupboards and shelves for the reception of new clothing, linen and bandages, and so forth; possibly in a small hospital this department would control the linen intended for laundry or mending, and in such case special and separate provision would be required for both.

In small hospitals resident surgeons or pharmacists would not be required; more probably local

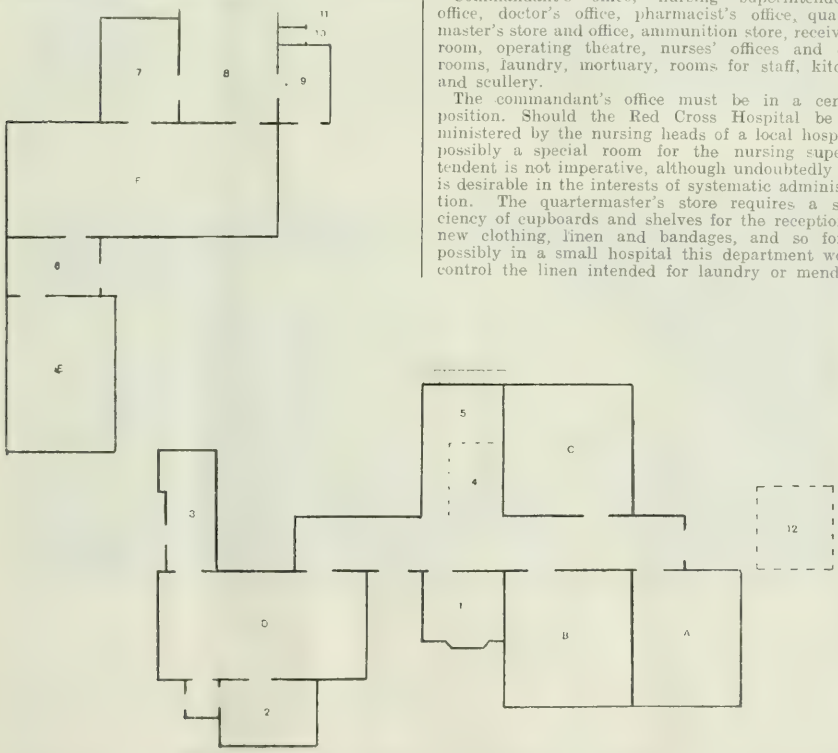


Fig. 2.—Elementary Schools Converted into Hospital.

A—Six-bed ward; B—Eight-bed ward; C—Eight-bed ward; D—Fourteen-bed ward; E—Eight-bed ward; F—Fourteen-bed ward; 1—Commandant's office; 2—Nurses' duty-room; 3—Ammunition store; 4—Quartermaster's store; 5—Baths; 6—Lobby and emergency store; 7—Scullery; 8—Kitchen; 9—Store and larder; 10—Boots; 11—Coals; 12—Temporary building as receiving block.

[illegible] property.

[illegible] not so necessary for smaller units taking invalids who [illegible] pital, the authorities of which have supplied full particulars of each case, showing the advisability of [illegible] a nursing ward.

The nurses' offices require ample fittings for sanitary purposes, including the supply of hot water, which is often a difficulty met in adapting public buildings, owing to the existing arrangements being inadequate. In emergency I have proposed connections from existing water or steam heating pipes to [illegible]

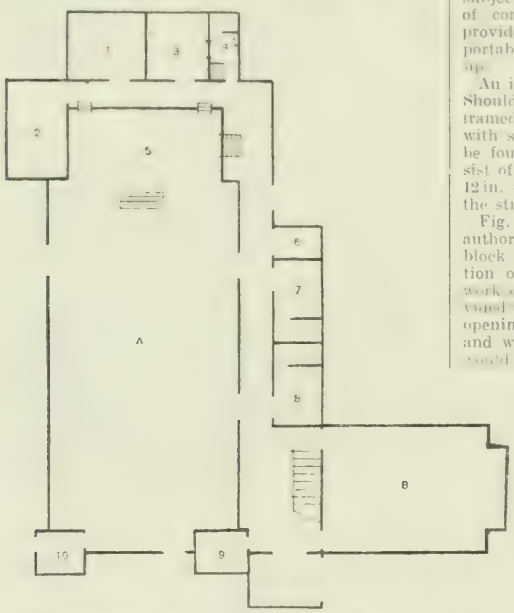


Fig. 3.—Public Building Converted into Hospital.

A—Forty-two-bed ward. B—Ten-bed ward. C—Ten-bed ward. 1—Kitchen. 2—Scullery. 3—Nurses' duty-room. 4—Patients' lavatory. 5—Administration. 6—Coals. 7—Patients' bathroom and lavatory. 8—Nurses' stores, hospital sinks, &c.; 9—Commandant; 10—Quartermaster.

would be raised in temperature by the heated coil (Fig. 1). Gas geysers are extremely useful for small supplies, as boiling water is obtainable at the shortest notice. Self-contained coppers have the advantage that a large supply of hot water can be maintained, and, in the absence of better arrangements, they [illegible] flues into existing chimneys, or direct to the open air.

Among the sanitary fittings hospital sinks are very important; in the absence of the correct pattern a substitute can be made by fitting a deep sink of the scullery type over an ordinary washdown pan.

As a rule, it may be taken that the nurses do not sleep on the premises, and bedrooms need not be specified; but one or more rooms as dining-rooms, duty-rooms, &c., are required, according to the size of the hospital.

In most towns arrangements would be made with local laundries for the washing of linen, but should a laundry be required a separate building is preferable, with, if possible, a chamber that could be used [illegible] purposes. Near [illegible] accommodation [illegible]

The difficulty of getting up [illegible] can be overcome by obtaining the wheeled portable type that after use [illegible] to sanitary [illegible] In emergency, the following will be found useful: Glazed stoneware channels indoors leading to trapped gullies outside, or lead waste pipes provided with suitable traps, with bell-mouth inlets flush with corridor floors, and discharging over trapped gullies outside. Care is necessary to prevent the bath outlet valve choking after use, and immediately after a discharge of soapy water, a quart of boiling water in which a handful of common washing soda has been dissolved should be poured through to remove any settlement of soap. When the pipe or outlet intended for bath discharge is not easy of access, a connection may be made by a rubber tube, and with care will be found [illegible]

The cooking department is one of the most important in this work. The advice given by our premier [illegible] is equally good when they are wounded, and large kitchens amply supplied with cooking arrangements are imperative. As emergency cookers, gas stoves are exceedingly useful, and have the advantage that, subject to sufficient ventilation to allow the escape of consumed gas, an unlimited number can be provided according to requirements. For hot water, portable coppers or hot-water coils can be fitted up.

An important addition to the kitchen is the larder. Should no room be available, one or more light-framed structures consisting of galvanised-iron roofs, with sides and door covered by perforated zinc, will be found useful. When the whole of the sides consist of perforated zinc, the roof must project at least 12 in. on every side. Ample bracing is required to the structures to prevent upsetting by strong winds.

Fig. 2 shows elementary schools as designed by the author for use as a Red Cross hospital. The lower block (girls and infants) was intended for the reception of thirty-six patients and all administration work except cooking. Wards A, B and C, being provided with a sufficiency of glazed doors and windows opening to the main corridor, were easily controlled, and without this internal lighting the nursing staff could have been severely overworked. By use of matched partitions the quartermaster's store and bathrooms were erected in the space reserved for children's coats, &c., and washing, the water supply and drainage here being adapted for baths. The infants' lobby was reserved as an ammunition store. No suitable room being obtainable, a temporary building was provided as a receiving block.

The boys' school, which was of a more ancient type, had fortunately recently been altered to meet modern requirements, and the manual instruction rooms were already fitted up for cooking classes, and made a suitable kitchen and scullery. In addition, two wards capable of holding twenty-two beds [illegible] provided, making a total accommodation of fifty-eight beds, with a cubic space of 1,000 ft. per bed.

Fig. 3 shows a public building which possibly was inferior to the schools in respect to lighting and ventilation, but had a decided advantage in respect to administration. The stage, in addition to being fitted up with store cupboards, &c., was an excellent position from which the whole of ward A could be supervised. Two smaller halls, one on the ground floor the other immediately above, were used as smaller wards. The cloak-rooms, call-rooms and dressing-rooms were all used for such purpose that their position and construction made most suitable.

No operating-room was provided for either of the foregoing, a local hospital having lent their theatre to the Red Cross nursing detachment.

For disinfecting purposes, in the absence of any appliance more suitable, the chambers described in a previous article on "Disinfection" could be adapted, and if cases of typhoid occurred, should there be no typhoid incinerator at hand, a tar-boiler would be all-sufficient. The disinfecting properties of tar are well known, and a thorough boiling should sterilise any liquid or semi-liquid infected matter, as, in addition to other properties, the boiling-point of tar is in excess of 212 deg. Fahr., and that alone is claimed to be destructive to micro-organisms.

Improved Road Surfacing in Grangemouth.

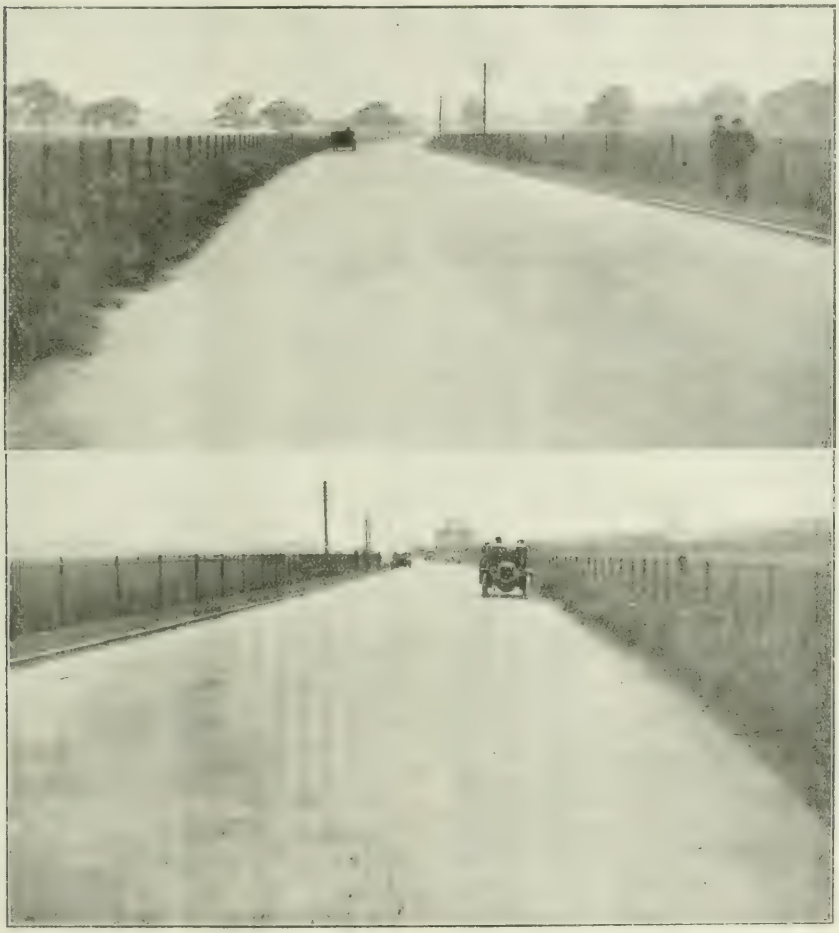
By DAVID A. DONALD, C.E., Burgh Engineer.

Prior to 1910 experiments were conducted on the medium and light traffic roads in this burgh with ordinary macadam tar-sprayed; tar-macadam in situ with Aitken's patent sprayer; and tar-macadam on the Gladwell system. Since 1910 the efforts on road improvement have been almost entirely confined to the highways or heavy traffic roads. In March to June of that year that section of the highway approximately 1 mile in length and passing through the residential area of the burgh was the subject of further experiment.

This road was divided into four sections, and treated with Rocmac (No. 1 section), double tar-grouting (No. 2 section), ordinary macadam tar-sprayed (No. 3 section), and ordinary macadam (No. 4 section.)

ROCMAC.

The Rocmac section took the form of surfacing recommended by the proprietors of Rocmac—namely, spreading the prepared matrix on the old surface of the road, which had previously been scarified, applying the metal, and rolling until the matrix was forced into the interstices of the metal. During the summer months of 1910 this road was quite as dusty as an ordinary macadam road, but since then there has been a gradual diminution of the dust nuisance in the summer months. In the winter months the road was comparatively clean, particularly so after a shower of rain, and little or no scraping has been required. In the beginning of this summer (1914), after a life of four years, this section could be said to be in as good condition almost as the day it was laid. In order further to minimise the dust nuisance the surface of this section has been sprayed, partly with tar and partly with Fluxpelite, and the, while affecting its primary object, will, I anticipate, add to the life of the road.



Mexphalte Grouted Roads at Grangemouth.

The cost of the Rocmac was as undernoted:—

Material.	Quantity per sq. yd.	Price per sq. yd.
2 in. hand-broken metal	[illegible] tons	[illegible]d.
Limestone chips and dust	[illegible] tons	[illegible]d.
Rocmac solution	[illegible] gallons	[illegible]d.
Carriage	[illegible] hours	1·71d.
Labour	[illegible] hours	[illegible]d.
Rolling	[illegible] days	[illegible]d.
		[illegible]d.

DOUBLE TAR-GROUTING.

The method adopted in the double tar-grouted section was as follows: The old road surface was thoroughly washed and swept clean with a rotary broom, and allowed to dry. This surface was thereafter sprayed

GRANGEMOUTH ROAD SURFACING (MEXPHALTE GROUTING).

Quantity.	Cost of Materials, Labour, &c. £ s. d.	Per	Description.	Quantity per sq. yd.	Cost per sq. yd. d.	Cost of 7,445 sq. yds. £ s. d.	Remarks.
			METALLING.				METALLING.
1,063 tons	0 7 9	ton	Whinstone metal delivered in railway siding	·1143 tons	9·86	35 12 3	Metal coated and spread on road in ... [illegible]
569½ hours	0 1 2	hour	Haulage (the average haulage was 500 yds.)	—	1·67	5 4 5	Average tonnage per day [illegible]
712 hours	0 0 7·35	hour	Labour spreading metal and regulating crossfall	—	·704	21 16 1	Greatest [illegible]
					11·45	59 12 9	* Average area of road coated per day [illegible]
							Greatest [illegible]
27 days	1 15 0	day	Use of roller (including £4 19s. for coal	—	1·985	52 4 0	
			ROLLING.				
			GROUTING.				GROUTING.
Mexphalte—4532 tons 10,066 galls. Fluxphalte—2,636 galls.	5 17 6 0 0 5½	ton) gall.)	Bituminous compound consisting of 80% of Mexphalte and 20% of Fluxphalte, delivered at railway siding. NOTE—1 ton Mexphalte = 234 galls.	1·78 galls.	10·672	53 10 6	Bituminous grouting applied in [illegible] Average quantity of compound applied per day [illegible] Greatest [illegible] (No fluxing applied on this day.)
54½ hours	0 1 2	hour	Haulage of Mexphalte and Fluxphalte (the average haulage was about 1 mile)	—	·007	3 0 1	Average area of road grouted per day ... [illegible]
82½ tons	0 6 3	ton	; whinstone chippings delivered in railway siding	·011 tons	·82	25 15 7	Greatest [illegible] (No fluxing applied on this day.)
84 hours	0 1 2	hour	Haulage of whinstone chippings (the average haulage was about 500 yds.)	—	·158	4 18 0	
1,471 hours	0 0 7	hour	Labour heating and applying compound, spreading chippings and brushing into interstices	—	1·387	42 19 3	
940 tons	0 16 6	ton	Coals	—	·241	7 15 1	
					13·397	414 18 6	
			FLUXING.				FLUXING.
Mexphalte—1428 tons or 3,342 galls. Fluxphalte—827 galls.	5 17 6 0 0 5½	ton) gall.)	Bituminous compound consisting of 80% of Mexphalte and 20% of Fluxphalte delivered at railway siding NOTE—1 ton Mexphalte = 234 galls.	·561 gall.	3·362	104 2 4	Bituminous compound applied in [illegible] Average quantity of compound applied per day [illegible] Greatest [illegible] (389 galls. grout applied on this day.)
17 hours	0 1 2	hour	Haulage of Mexphalte and Fluxphalte (the average haulage was about 1 mile)	—	·032	15 10	Average area of road fluxed per day ... [illegible]
26 tons	0 6 3	ton	* ; whinstone chippings delivered in siding	·0063 tons	·262	8 2 6	Greatest [illegible] (389 galls. grout applied this day.)
11 tons	0 9 6	ton	* ; Limestone chippings and dust, delivered in siding	·0023 tons	·169	5 4 6	
46 hours	0 1 2	hour	Haulage of whinstone and limestone (the average was about 500 yds.)	—	·086	2 15 8	
537 hours	0 0 7·91	hour	Labour heating and applying compound and spreading chippings	—	·572	17 14 0	
273 tons	0 16 6	ton	Coals	—	·073	2 5 0	
					4·556	141 4 10	
			SUNDRIES.				GENERAL.
6 weeks	0 10 0	week	Hire of four boilers, plus carriage £3	—	·484	15 0 0	The work extended over [illegible] 29 working days.
—	—	—	Use of tools, &c., brushes, shovels, fluxing and grouting pails, &c.	—	·089	2 15 0	Days on which weather was suitable for grouting and fluxing [illegible] 21 days.
42 nights	0 3 9	night	Watching, plus lighting 13s. 6d.	—	·276	8 11 0	Days on which weather was dull or wet [illegible] 8 days.
—	—	—	† Sweeping and removing surplus ashes from surface of road	—	·169	5 4 9	
—	—	—	Haulage of plant to and from site of work	—	·124	3 15 10	
—	—	—	Raising manhole covers, and tobies, removing rubbish and surplus material, &c.	—	·353	10 18 7	
					1·494	46 5 2	
					32·777	£1 015 2 3	

* NOTE.—4,111 sq. yds. of road blinded with whinstone chippings. 3,322 sq. yds. of road blinded with limestone chippings.
† Road was bottomed and blinded with ashes six months prior to surfacing.

with hot bituminous tar and a coating of metal applied in two layers, the first layer being grouted with tar, and the second or top layer of metal being immediately applied. After a sufficient length of road had been coated to the full thickness, the second or top layer of metal was grouted as before, blinded with ¾-in. clean whin chippings, and rolled until consolidated, after which the road was sprayed with tar, blinded with clean ¼-in. chippings, and again rolled. The surface so obtained was left for about a week or ten days, when it was sprayed with tar and blinded with clean ¼-in. chippings. This section has given excellent results. There has been no disintegration of the surface. It has, however, been surface-sprayed every summer. It has now been down for over four years, and since it had its surface dressing at the beginning of this summer (1914) it appears to be in better condition than I have yet seen it. It has a hard metallic surface, and in the winter months requires no more cleaning than a causewayed or asphalt road.

The cost of this section was as follows:—

Material.	Quantity per sq. yd.	Price per sq. yd.
2½ in. hand-broken metal	·119 tons	8·75d.
¾ in. whin chips	·017 tons	1·05d.
Carriage	·077 hours	·84d.
Tar	1·81 gallons	4·97d.
¼ in. whin chips	·004 tons	·29d.
Labour	·18 hours	1·68d.
Roller	·0027 days	·82d.
		17·25d.

ORDINARY MACADAM TAR-SPRAYED.

The ordinary macadam tar-sprayed section was laid down by the usual method, special attention being directed to the quality of the binding material, which consisted of ¼-in. chippings with about 20 per cent of dust. The clean form of binding used entailed a considerable amount of rolling. After this road had thoroughly dried, the surface was swept (the interstices of the metal being well opened up), sprayed with tar well brushed into the road with hand brooms (1 gallon of tar covering 2·82 sq. yds.), and covered with clean ¼-in. chippings. The tar-spraying on this section stood out well until the beginning of November, 1910, when it started to break up, particularly in the centre of the road, which had to be scraped periodically during the winter months.

This section has been sprayed in the summer months which have followed, and each summer it is found more difficult to clean the road preparatory to surface-tarring, an ordinary rotary brush preceded by a watering-cart having little or no effect. This difficulty was got over this summer by scouring the road with water under pressure from an ordinary fire hose.

At the beginning of this summer several potholes were in evidence on this section, but with the tar-spraying these have to a considerable extent disappeared. I anticipate, however, that after the winter of this year a good deal of patching will be required.

The cost of this section was as follows:—

Material	Quantity per sq. yd.	Price per sq. yd.	
2½ in. hand-broken metal	·10 tons	6·75d.	
¾ in. chips and dust	·008 tons	·60d.	
Carriage	·116 hours	1·40d.	
Watering	–	·28d.	
Labour	·16 hours	·96d.	
Rolling	·005 days	1·44d.	
			11·27d.
Tar Spraying—			
Sweeping road surface with rotary brush and removing sweepings	·0024 hours	·037d.	
Labour assisting at ditto	·0024 hours	·036d.	
Bituminous tar	·35 gallons	·974d.	
¼ in. whin chippings	·0054 tons	·276d.	
Labour heating and applying tar and chippings	·045 hours	·27d.	
Carting chippings	·004 hours	·048d.	
Sundries	–	·014d.	
			1·76d.
Total			12·98d.

ORDINARY MACADAM.

The fourth section—ordinary macadam—was laid in the manner described in the preceding section, but was not tar-sprayed. Nothing has been done to this section during the last four years, with the result that it is tracked, and has a considerable number of potholes and will require to be recoated at an early date. The cost of this section was the same as the immediately preceding one, less, of course, the tar-spraying.

GENERAL.

Acting on the results of these experiments, I have abandoned entirely ordinary macadam and ordinary macadam tar-sprayed (except on light-trafficked streets, where tar-spraying has been quite satisfactory, keeping a good surface during the winter months), and until this year have adopted the double tar-grouting process with more or less satisfactory results.

A considerable amount of tar-spraying is carried on every summer, and all the streets in the burgh which are in fair surface have been dealt with in this manner.

The sprayer supplied by Llewellins & James has been used for this work, and, given good weather, I have been able to get between 800 and 900 gallons of tar put down in an ordinary working day.

ROAD RECONSTRUCTION.

In addition to the ordinary tar-spraying and improved surfacing of the roads, two sections of road have been reconstructed: (1) 466 lin. yds. of the Low Road to Stirling, viâ Airth and Dunmore, and (2) 900 lin. yds. of the Bo'ness—Grangemouth—Falkirk—Glasgow road.

Low Road to Stirling.—This road, which, for the greater portion of its length, was considerably below the high water of ordinary spring tides, and liable to be flooded, was raised about 3 ft., bottomed with 9-in. hand-set bottoming, and surfaced partly with tarred macadam tar-sprayed and partly with double tar-grouting tar-sprayed. The total cost of this reconstruction amounted to £1,375, which included the building of a cheap form of retaining fence (constructed with sleepers placed vertically at 9-ft. centres tied into the old road surface with ¾-in. iron bolts and anchor plates in concrete, the length between the uprights being filled in with sleepers placed horizontally), and the alteration of various parapet walls and fences and subsoil drains.

The surfacing was carried out in the early summer of 1913, and it is interesting to note that at the beginning of this summer, whereas the tarred-metal portion of the road showed signs of disintegration, the double tar-grouted portion was in fairly good surface. The whole road, however, was surface-tarred this summer.

Bo'ness—Grangemouth—Falkirk—Glasgow Road.—A section of this road (practically level for its entire length) was reconstructed at a cost of £2,100, which included the lifting and resetting of the existing kerb and channel, 9 in. of hand-set whin bottoming, and surfacing with whinstone, grouted and fluxed with a bituminous compound consisting of 80 per cent of Mexphalte and 20 per cent of Fluxphalte. The method of surfacing was as follows:—

Whinstone, of which 65 per cent was broken to the size of 2½ in. and 35 per cent to sizes graded from 2½-in. to 1¼-in., was applied to the road at the rate of an average of 7 sq. yds. to the ton, rolled down dry until a fair surface was obtained. The whinstone was thereafter grouted with the bituminous compound above referred to at the rate of 1½ to 2 gallons per square yard, depending on the thickness of the metal coat, the grouted surface being immediately covered with ¾-in. clean whinstone chippings at the rate of 91 sq. yds. to the ton, and rolled rapidly before the grout had time to set. The surface thus obtained was, after a period of twenty-four hours, fluxed with the same compound at the rate of ½ gallon to ⅝ gallon per square yard, floated over the road surface with suitable brushes and immediately thereafter covered with, on part of the road, ⅜-in. clean whin chippings, and on the remainder of the road, ¼-in. limestone chippings and dust, at the rate of 1 ton to 160 sq. yds. and 1 ton to 300 sq. yds. respectively, the traffic being allowed to work the chippings in.

To enable the work to proceed without any waiting, four boilers were used, three of these boilers being employed boiling the Mexphalte and one the Fluxphalte. Four barrels of Mexphalte were put into each of the three boilers, and the quantity of Fluxphalte required to make the mixture of Mexphalte and Fluxphalte was added to the Mexphalte boilers from the other. The mixture was well stirred up, and brought to a temperature of 400 deg. Fahr. The quantity of compound in each boiler was a known one, and the area of the road surface to be grouted or fluxed was marked off, and the contents of the boiler applied. Ordinary grouting cans were used in applying the compound. When grouting these were fitted with special fish-tailed nozzles about 4 in. broad and ¼ in. open in the centre opened out to ⅜ in. at the sides, and when fluxing, with spreaders 18 in. wide and 6 in. deep, which spread the compound evenly for rather more than the width of the spreader. The area of

[illegible] £1,015.

[illegible]

[illegible] heavy traffic in addition to an hourly service of motor buses between Grangemouth and Falkirk. It would be premature to give an opinion at the present time, but so far this road appears to have improved with its age. It will have a severe test during the winter [illegible]

PRO PATRIA.

[TWELFTH LIST.]

We present herewith the twelfth list of municipal engineering and sanitary officials who are taking part in the war and shall be glad to hear of other cases within the knowledge of our readers.

[illegible] Mr. T. H. [illegible] Meerden Rural District Council, Royal Army Medical Corps [illegible] for active service.

Dadley, C. F., city estate surveyor's office, Oxford, Territorial Division, Oxford and Bucks Light Infantry.

[illegible] Pennycuick, has joined the R.A.M.C.

Frazier, Cyril, pupil, borough surveyor's department, St. Ives (Cornwall), Duke of Cornwall's Light Infantry.

Gardner, H., sewage works employee, Corporation of Leeds, private, Army Service Corps.

Gibson, W. L., county surveyor and engineer to the [illegible] County Council, Lieutenant, Scottish Horse.

Jennings, W., borough surveyor's department, St. Ives (Cornwall), sergeant, No. 5 Company, Duke of Cornwall's Light Infantry.

King, T. F., assistant borough surveyor, St. Ives (Cornwall), corporal, 5th Battalion Duke of Cornwall's Light Infantry (Territorials).

Lucas, Cyril, town clerk's office, Oxford, Territorial Division, Oxford and Bucks Light Infantry.

[illegible] Urban District Council, motor bicycle dispatch rider, Northumberland Hussars Yeomanry.

Renton, T. Bryson, pupil (and son) of the surveyor, Whickham Urban District Council, motor bicycle dispatch rider, Northumberland Hussars Yeomanry.

Turrill, William, engineering assistant, city engineer's Department, Oxford, Queen's Own Oxfordshire Hussars, with Expeditionary Force.

Wagstaff, C. P., public library department, Oxford, Territorial Division, Oxford and Bucks Light Infantry.

Wake, Harold, assistant in sanitary department, Oxford, Territorial Division, Oxford and Bucks Light Infantry.

Wall, R., clerks' department, city engineer's office, Worcester, 8th Battalion, Worcester Regiment (for foreign service).

Webb, H. M., B.SC., engineering assistant, city engineer's office, Worcester, 8th Battalion Worcester Regiment (for foreign service).

Willcox, Claude, correspondence clerk, city engineer's Department, Oxford, Territorial Division, Oxford and Bucks Light Infantry.

Williams, W. L., chief assistant, borough engineer's office, Wrexham, Second Lieutenant, 9th Battalion, South Wales Borderers.

Lieutenant Arthur Evans, son of Mr. Evan Evans, county surveyor of Carnarvonshire, a member of the [illegible] severely wounded [illegible] he had to have one of his legs amputated.

CONCRETE ROADS.

TRIAL SECTIONS IN KENT.

Mr. H. T. Chapman, [illegible] Road, [illegible] Road Board [illegible] Road Board [illegible] Dover [illegible] Canterbury and Sandwich [illegible] 1 mile [illegible] 7 [illegible]

[illegible]

Section 1, 2, 3a, 3b, 3c.

Concrete.—Six parts of [illegible] 1 of cement.

Gravel.—Washed and screened 25 per cent. [illegible] 1-in. screen, retained on [illegible] 25 per cent. all through [illegible] screen, retained on [illegible] 25 per cent. all through [illegible] 22 screen; 25 per cent. clean, sharp sand all through $\frac{3}{16}$-in. screen.

Thickness of Concrete.—6 in.

Section No. 1.

Reinforcement.—Expanded Metal Company's No. 61 3-in. diamond mesh expanding steel, 3 ft. wide. Sheet bedded in the concrete 2 in. from the surface, and to extend 18 in. on either side of centre joint.

Finished Surface.—Sufficiently rough to give good foothold.

Section No. 2.

Reinforcement.—Same as No. 1.

Finished Surface.—When surface has become quite dry to be dressed with tar and a thin coat of $1\frac{1}{4}$-in. clean limestone chippings.

Section No. 3a.

Reinforcement.—[illegible] diameter round indented steel bars, placed $1\frac{1}{2}$ in. from top surface of the concrete, 9 in. c. to c., both longitudinally and transversely.

Finished Surface.—Same as No. 2.

Section No. 3b.

Reinforcement.—Expanded Metal Company's No. 61 diamond mesh expanded steel with strands $\frac{5}{16}$ in. by $\frac{1}{4}$ in., to be placed 2 in. from top surface.

Finished Surface.—Same as No. 2.

Section No. 4a.

Reinforcement.—United States Steel Product Company's triangle mesh steel wire reinforcement No. 7, to be placed 2 in. from top surface.

Finished Surface.—Same as No. 2.

Section No. 4b.

Reinforcement.—British Reinforced Concrete Engineering Company's B.R.C. fabric, reference No. 9, to be placed 2 in. from top surface.

Finished Surface.—Same as No. 2.

General.

Filler for Expansion Joints.—Commercial soft pitch, to Road Board Specification No. 6.

Protection of Surface.—When concrete has set surface shall be covered with wet sand 2 in. in depth, same not to be moved for eight days. Sand to be kept wet.

The surface of the concrete in all cases to be suitably roughened to give a foothold to horses. Longitudinal and transverse expansion joints to be provided in all sections.

It may be stated that the British Portland Cement Manufacturers, Limited, are supplying the specially prepared slow-setting cement, and the firms above mentioned the reinforcing materials, free of cost.

The work will be in hand next week, and Mr. Chapman's assistant, Mr. Gordon Stevens, who is superintending it, will be happy to give all visitors any information.

Bedfordshire Roads. In his annual report on the roads the county surveyor of Bedfordshire, Mr. W. H. Leete, states that there are 735 miles of rural main roads in the county, an increase of 38 miles since 1896-7. Their total cost in 1896-7 was £30,918, or £44 6s. 5½d. per mile, and in 1913-14 it was £58,365, or £79 7s. 2d. per mile. Towards this sum £4,189, or £5 13s. 11d. per mile, has been contributed by the Road Board, so that the nett cost to the county was £73 5s. 5d. per mile. The actual rise in the past year was £5 18s. 2d. per mile. Urban main roads are also far more costly than they used to be.

Law Notes.

Edited by J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE STATION, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction (i.e., without re-drawing or amendment). Unless these conditions are complied with we cannot undertake to reply to queries.*

STREET WIDENING: COMPULSORY PURCHASE: INTERFERENCE WITH MAIN STRUCTURE.—The decision of Mr. Justice Joyce in the case of *London County Council v. Allen*, 29 T.L.R. 28, has been affirmed by the Court of Appeal (17 T.L.R. 28). It may be remembered that the council sought to purchase compulsorily the freehold of a chapel for the purpose of street widening under the London County Council (Tramways and Improvements) Act, 1904. The trustees of the chapel refused to sell the freehold separately, and required the council to purchase the whole of the property on the ground that the proposed scheme would practically destroy the access to the building. Sec. 18 of the Act empowers the council to take such parts as they may require of properties without being compelled to purchase the whole, but with the important proviso that the council are not to be entitled to take or interfere with the main structure of any building. Mr. Justice Joyce held that the destruction of access would constitute an interference with the main structure within the meaning of the Act. In the Court of Appeal it was contended, on behalf of the council, that the section only applied to the taking of property, and had no reference to the works executed after it was taken; also that, inasmuch as the council did not propose actually to take any part of the building there would be no "interference" with the main structure. In the course of his judgment, dismissing the appeal, the Master of the Rolls said it was proposed to take practically the whole of the forecourt of the chapel, and to leave it abutting directly on the new footway, the effect of which would be to render the access to the main structure of the chapel impossible to be used without danger, and to make one of the side entrances equally dangerous; in fact, there would be something like a precipice at the foot of the steps. On the facts of the case, it was hard to imagine a clearer case of interference. The chapel could not be used without reconstruction if the proposed works were carried out. They not merely destroyed the present access, but left no reasonable mode by which a new access could be obtained. There would be a declaration that the defendants were not entitled to take the portion of the plaintiff's chapel specified in the notice to treat without taking the whole, and an injunction as asked for by the writ.

NEW STREET: RESTRICTIVE COVENANT.—An important point in connection with the laying out of a new street was decided in *London County Council v. [illegible]* (Times, 17 T.L.R. 28). A landowner made an application to the council for their sanction to the laying out of a new street under sec. 7 of the London Building Act, 1894. The council agreed to give such sanction conditionally upon the owner entering into a covenant not to build upon a piece of land abutting on the end of the proposed street, so that it should be possible to extend it at some future time. This condition was agreed to, and the owner entered into a covenant with the council accordingly. Subsequently, however, he sold the land in question to the defendant, who, although he had notice of the covenant entered into by his vendor, began to erect houses on the land. The council thereupon brought this action to prevent him from building. But it was held on the Court of Appeal that the defendant was not bound by the covenant and was entitled to build in spite of it. The ground of this decision was a somewhat technical one—viz., that the council were not in possession of, nor interested in, any land for the benefit of which the covenant was entered into.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X. combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

ACETYLENE GENERATOR.—"A. R." writes: Will you kindly give me the following particulars respecting the storage of carbide? (1) Is there any rule or regulation which prohibits the generator being fixed inside the dwelling-house? (2) Is the generator for making acetylene gas subject to inspection; if so, by whom?

(1) The provisions of the Petroleum Act are applied to carbide of calcium with modifications by an Order in Council dated August 8, 1912. The Order provides that the quantity of carbide of calcium that may be kept without a licence shall be (i) Where not to be kept in separate hermetically closed metal vessels containing not more than 5 lb. each, 25 lb. (ii) Where the following conditions are observed, 28 lb. (a) to be kept in a metal case, in vessels hermetically sealed at all times when it is not being placed in or withdrawn from the vessel; (b) vessels to be kept in a dry and well-ventilated place; (c) the precautions to be taken to prevent unauthorised persons having access; (d) notice to be given to local authority, and free access to their inspector to premises where carbide kept and generator situated; where a fixed generator is used on the premises, (e) certificate signed by maker or supplier of generator that it complies with regulations of British Acetylene Association to be exhibited near it; (f) full instructions as to care and use of generator to be posted, so as to be conveniently referred to by attendant. Where any of the above conditions are not observed, or the quantity exceeds 28 lb., a licence is necessary. (2) Apparently not. (3) Yes, by the local authority's inspector. See clause (d) above.

CAMPS FOR ALIENS.—"F. C." writes: As a regular subscriber to your paper, I shall be glad if you could inform me if the Government has authority to set up camps for the imprisonment of aliens within the town boundaries. Under what powers can they set up camps? Have the town authorities officials any right of inspection? I imagine the camp that is being erected here is intended as a holiday camp in summer, and is capable of holding 3,000 persons; therefore I find it very necessary to give careful inspection during the summer months, and seeing that it is being used for aliens I consider that even more care should be taken to protect the ratepayers from any outbreak of fever.

These camps are presumably under the control of the Secretary of State for War, who has power to make rules for their government and to appoint inspectors, &c. It would therefore appear that, under subsec. 7 of sec. 9 of the Housing, &c., Act, 1885, they are exempt from inspection by the sanitary authority or their officers.

INSPECTOR OF NUISANCES: DUTIES.—"G. J. S." writes: Would you be good enough to define the exact duties of an inspector of nuisances to a rural district council: (1) With regard to the reconstruction of old drains and appliances to buildings which may be necessary under an order from his authority? (2) With regard to new drains, cesspools, and buildings which may be erected in consequence of an order from his authority? (3) What would be the duties and authority of the buildings surveyor to the same council in relation thereto?

1 and 2. The duties of an inspector of nuisances are set out in Article 26 of the Local Government Board "Sanitary Officers (Outside London) Order, 1910," and in Article 20 of the "Sanitary Officers (Port) Order, 1910." Clause (13) of Article 20 of the first of these Orders directs that the sanitary inspector shall, if directed by the council to do so, superintend and see to the due execution of all works which may be undertaken under their direction for the suppression or removal of nuisances. It will therefore be the duty of the inspector, if so directed by his council, to superintend and see to the due execution of any works which may be undertaken with respect to drains, cesspools, and buildings, whether old or new, for the suppression or removal of nuisances. (3) If so required by the council the surveyor would have to superintend the execution of the works.

AWARDED ROADS.—"B. H." writes: Are there any quoted cases of disputes as to to whether an award road is a public or a private street?

There are one or two reported cases arising from disputes as to the status of awarded ways. In *Corbett v. Barnes*, L.R., 7 C.P., 104, a road was set out as a public road under an award and fenced, but was never formed and completed so as to satisfy the requirements of the General Inclosure Act, 1801, nor was it ever taken to or used by the public as a highway. It was decided that the road had not become a highway. In *Sandiman v. Urban District Council v. Hickey*

[illegible] April [illegible] 1904, p. 46, a strip [illegible] an [illegible] awarded as a [illegible] to be used for wheeled [illegible] for [illegible] years the [illegible] to foot passengers. Mr. Justice Joyce held that the user for [illegible] and that no length of time could legalise it, since, after the Award, no [illegible] public highway. In [illegible] the surveyor, [illegible] footpath [illegible] Award in 1904. In this case [illegible] The way had become a public highway for all purposes, by public user, and the [illegible] whether it was reputable by the inhabitants at large. The evidence showed that it had not become a public highway until after the passing of the [illegible] Act, and [illegible] had never been formally [illegible] under sec. [illegible] of that Act the House of Lords held that it was not reputable by the inhabitants at large.

STANDARDS FOR SEWAGE EFFLUENTS.

PROPOSED CENTRAL AUTHORITY.

In the autumn of 1913 a committee of the Association of Municipal Corporations held a number of meetings at Leeds to consider the probable effect of amending the Public Health Act, 1875, on the lines of the recommendations of the Royal Commission on Sewage Disposal, and particularly to consider those recommendations which are set forth in the Summary of Conclusions, par. 62, p. 17, of the Eighth Report.

The discussions established the fact that the committee—whose members were selected for their skill and experience in the design and maintenance of sewerage and sewage disposal works—are in complete agreement that the law as it stands is greatly in need of amendment, but that it is not desirable that standards of purity should be prescribed by Parliament as the Royal Commission recommend.

As a reason for this decision, Mr. J. D. Watson, M.Inst.C.E., engineer to the Birmingham, Tame and Rea District Drainage Board, in a letter addressed to the secretary of the Association of Municipal Corporations, on behalf of the committee, points out that the predominating factor in considering the advisability of creating a standard by Act of Parliament is the fact that no two cases are precisely similar. Accordingly the committee are of opinion that it should be left to a central authority to determine finally all disputes as to the quality of effluents, and to settle any incidental questions, such as the amount of compensation or damages, while there should also be power to make regulations as to the taking of samples.

The committee have come to this view with reluctance, being aware of the prevalent objection to multiplying Government Boards, but they see no workable alternative; the setting up of a standard of purification by Act of Parliament they believe to be quite impracticable. They proceed to suggest that any amendment of the law "should be to improve or conserve the condition of the rivers, and not to compel municipalities to discharge sewage effluents of uniform quality." Just as the judgment of the Local Government Board in matters of construction is now accepted, so, they consider, should the decision of the proposed central authority be accepted in all matters relating to the pollution of rivers; and as the Local Government Board have power to vary their requirements as a condition of sanctioning a new loan, so should the central authority have power to vary their requirements as a condition of assuming responsibility for allowing effluent to enter a stream. Finally, the committee express the belief that a central authority could greatly help municipalities by establishing and maintaining a national research department.

At their last meeting the Birmingham, Tame and Rea District Drainage Board passed a resolution to the following effect: "That the opinions of the experts be adopted as the views of the board in the event of Parliament being asked to legislate on the subject, subject to proper provisions safeguarding the rights of individuals and public bodies in the courts of the country."

Dangerous Tarred Roads.—At Otley on Wednesday a coroner's jury decided that the death of a young man was due to the slippery state of the tarred roads. They asked the coroner to inform the local authority that, as the roads are now made of such a fine, hard surface, they are unsafe both for horse and other traffic, and to urge the necessity of a systematic supervision of the roads.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.
—Massinger: "The Fatal Dowry," Act ii., 2

HOUSE REFUSE MANURE.

To the Editor of The Surveyor.

Sir,—I have read in your issue of 13th inst. the contents of a lecture delivered by Prof. E. R. Matthews at University College. In it the lecturer states that "there is great difficulty in disposing of house refuse to farmers," and quotes in support of his statement the failure of three French factories that manufactured house refuse manure for French farmers.

I wish most strongly to protest against so unwarranted an assertion. The failure of these companies may have been due to the fact that they did not treat house refuse in the proper way. Whether, however, this or any other be the reason, the following figures show that, at any rate so far as this country is concerned, not only is there no difficulty whatever in disposing of house refuse manure, but the contrary is positively the case. The following table shows the increase in the demand for house refuse manure made with Patent Lightning Dust Manipulators at the depot of the metropolitan borough of Southwark during the past eight years, the dates being until March 31st each year:—

Year.	Tons sold.	Year.	Tons sold.
1907	2,206	1911	10,056
1908	8,641	1912	15,440
1909	8,901	1913	18,346
1910	9,696	1914	19,495

I am informed that the demand now greatly exceeds the supply.

The corporation of Hove, Sussex, seem to find no difficulty in getting rid of this manure, for, having erected a plant in June, 1913, they are now about to erect three more machines.

I could quote more figures, but refrain in order not to trespass on your valuable space. Yours, &c.,

The Patent Lightning Crusher Co., Ltd.
(A. D. Furse, Manager).

14a Rosebery-avenue, E.C.
November 19, 1914.

THE TRAINING OF MUNICIPAL ENGINEERS.

To the Editor of The Surveyor.

Sir,—On the above subject, after thoroughly reading the report of the evidence given by Messrs Brodie and Platt, I quite agree that the ideal is fairly represented by Mr. Platt's evidence, and the practical or what does actually occur by Mr. Brodie. How many parents can afford £500 for a university career and pupilage plus keeping his son for five years without any remuneration? I am afraid not many, and there would be fewer if the parents would only realise that all assistants cannot be chiefs, and that some are not earning a salary large enough to allow of their being married. If Mr. Platt could get B.Sc.s for pupils, would he agree to a minimum salary of £150 for assistants?

I agree with Mr. Willis that a pupil who will work hard and carefully will reap more foundation work for his career in an office of an engineer in a town of about 30,000 inhabitants than in a large office where all work is specialised, and I think the pupil who has to gain his examinations by evening work cultivates perseverance and doggedness, and if in a small district he struggles to get on and into a larger office where work on a greater scale is executed. It would be interesting to know how many of the present chiefs of towns over 100,000 population began their careers in small offices. I think a man in municipal engineering ought to be compelled to pass the Municipal and County Engineers' examination, otherwise he ought not to be given a berth; then ultimately engineers might be on the same footing as solicitors. If he wishes to widen his studies, he can then take the Institution of Civil Engineers' examination.

As regards the Victoria University and Municipal School of Technology training, I disagree with Mr. Platt entirely when he says "that the latter course is not so good as the former." I think for the municipal engineer the Technical School's course is the better.—Yours, &c.,

Auld Lang Syne.

August 25, 1914.

The Surveyor

And Municipal and County Engineer.

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THE PONDING OF SEWAGE.

To the Editor of THE SURVEYOR.

SIR,—In an article by Mr. W. Naylor in THE SURVEYOR of the 20th inst. he draws attention to the purification effected by ponding of sewage on the Preston sewage farm some years ago. The same thing used to be noticeable on the Altrincham farm some years ago, where a similar procedure of ponding was followed. In this instance the sewage was ponded to a depth of some 9 in. to 12 in., and after a windy day, causing wavelets on the surface of the liquid, considerable improvement was effected by aëration, but also by deposition of fine solids, and, most of all, in sunshiny weather, by oxygen given off by green algæ.

At times the Cambridge sewage farm filtration areas, as seen from the Great Eastern Railway, resemble brilliant green carpets, brought about by the growth of algæ, and in this instance also the supernatant water is of a much better quality than the oncoming tank liquor. I have not seen the Preston farm since 1898.—Yours, &c.,

G. BERTRAM KERSHAW, M.AM.SOC.C.E.

9 Victoria-street,
Westminster, S.W.
November 20, 1914.

CAMP SANITATION: WATER.

To the Editor of THE SURVEYOR.

SIR,—Several readers have written me in respect to an error and omissions in my article on the above in your issue of last week. The error is in the formula $\frac{2^2}{12^2} \times \frac{W}{4} \times 6{\cdot}25$, which should have been $\frac{2^2}{12^2} \times \frac{\pi}{4} \times 6{\cdot}25$.

In respect to the horses' watering ground, the following description was omitted: T=troughs; C=trough fixed to land contour; D=horses drinking; W=first lines of animals waiting turn; R=remainder of horses; E=entrance gates; O=fences removed to make outlets to prevent oncoming horses impeding those leaving.—Yours, &c.,

G. BERTRAM HARTFELL.

Baverstock,
Alton,
Hants.
November 23, 1914.

The Ruislip-Northwood Town Planning Scheme. This will be the subject of a paper to be presented by Messrs. E. R. Abbott and F. M. Elgood, F.R.I.B.A., F.S.I., at a meeting of the Town Planning Institute to be held at 92 Victoria-street, S.W., on Friday, December 4th next. The chair will be taken at 8 p.m.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not permissible, though in a technical journal, to quote here and now the last two verses from a little-known poem "The Reveille" which Bret Harte wrote as a call to join the North in the United States War of 1861-4?

"What if, 'mid the cannon's thunder,
Whistling shot and bursting bomb,
When my brothers lay around me,
Should my heart grow cold and numb?"
But the drum
Answered, "Come!
Better there in death united, than in life a miserable
Come!"

Thus they answered,—hoping, fearing,
Some in faith, and doubting some,
Till a trumpet-voice proclaiming,
Said, "My chosen people, come!"
Then the drum,
Lo! was dumb,
For the great heart of the nation, throbbing, answered,
"Lord, we come!"

* * *

What would be said by John Rennie—the architect of three great London bridges, the engineer of the Plymouth breakwater, of the principal London docks, and of many other works of great national importance—if he could see the standard of modern locomotion? In 1763 the one stage-coach which formed the sole communication of the kind between London and all Scotland began to run; and Rennie, when a boy, was familiar with the sight of this uncouth vehicle lumbering along the road past his door. It "set out" from Edinburgh only once a month, the journey to London occupying from twelve to eighteen days, according to the state of the roads!

* * *

How long will it take before all the common courtesies of professional life have disappeared? Why is it that only a few years ago if one professional man wanted some information from another he wrote him a letter asking for it, whereas now he tells his typist to telephone for it?

* * *

Does it not seem rather cruel that some of our hard-earned money should be employed to pay Mr. Keir Hardie to retain his seat in Parliament? Is it not almost incredible that this man should be allowed to slander his fellow countrymen with impunity? Who could read Mr. Edgar Jones' indictment of this man's action without being amazed at the supineness of the people who can stand it as they do?

* * *

Is it not altogether a matter for surprise that the proposed new great road out of Portsmouth has been abandoned for the present? Is it not a fact that the chairman of the Road Board on being approached for a substantial grant towards the total estimated cost of £200,000, decided that there were other proposed roads of greater national importance? Does anybody know what is the *true* opinion of the military experts on the advisability or otherwise of this road, and does anyone know *where* are the proposed roads of greater national importance?

* * *

Is it true what some people are now saying, that if it had not been for the war this country would now have found itself plunged in the most bitter, prolonged and terrible labour strife that the world had ever seen? Does it not make us pause to reflect which catastrophe would have affected the ultimate fortunes of our country the most? Is there not always the great difficulty in all public affairs that one never can tell what would have been the result if something had not happened?

The New Southwark Bridge.—Mr. W. Hayward Pitman, chairman of the Bridge House Estates Committee of the Corporation, last week laid the foundation-stone of the new Southwark Bridge. Speaking afterwards, he said the approaches to the bridge were now virtually complete. Mr. Biggart, representing Sir William Arrol & Co. (Limited), the contractors, said he believed the bridge would be finished to contract time.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All [illegible] in regard to this page must be addressed to the Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. [illegible] Assistants' and Students' Section" in the top left-hand corner. Correspondents are invited to submit [illegible] for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

[illegible] are invited to the following [illegible]:

440. Bending Moment. [illegible]

441. Bending Moment.—A beam of 100 ft. span has [illegible] Draw the bending moment [illegible]

442. Building Materials.—What are encaustic [illegible]

443. Vectors. [illegible]

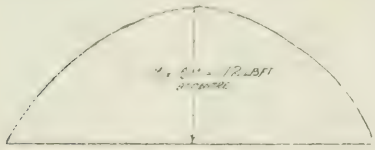
444. Strength of Shaft.—Find the relation between [illegible] and the moment producing it. Find the least diameter of a solid steel [illegible] the stress being limited to 9,000 lb. per square inch.

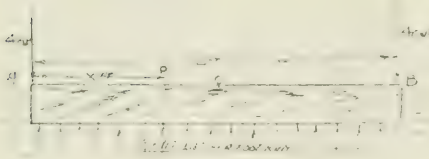
[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

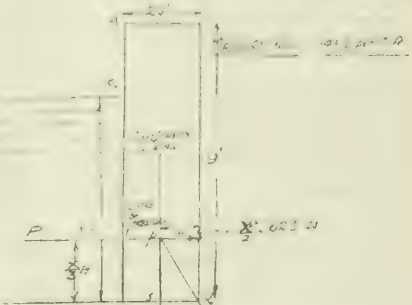
438. Strength of Materials.—If a straight prismatic baulk of timber floats in a horizontal position with a weight of 4 cwt. hung to each end, what will be the bending moment at the centre of its length?

If the beam is of uniform cross-section it will be immersed to a constant depth throughout its length, due to its own weight and the symmetrically placed loads of 4 cwt. at each end. Since the loaded beam floats, the total downward load must equal the total upward force due to the pressure of the water on the under surface. The upward force due to





the water pressure) acting on the wetted surface included between two cross-sections, say, 1 in. apart, is the same at any point along the beam, for the immersed surfaces are exactly alike and immersed to the same depth. Hence the baulk of timber is subjected to an upward equally distributed load, whose total value is equal to the "weight of beam + 8 cwt." It is obvious that there is no bending moment due to the weight of the beam, and the [illegible] equal to the weight of the beam, due to the water pressure, for we have two equal distributed loads acting in opposite directions. Hence the beam may be considered to be acted upon by a pair of [illegible] at each



end, and a uniformly distributed load of 8 cwt. acting upwards.

Let L ft. be length of beam. Load per foot-run acting upwards $\frac{8 \times 112}{L}$ lb. Taking moments about a point P distance x ft. from A we get—

$M = 4 \times 112 x$ = BM due to distributed load on AP

$$4 \times 112 x - \left(\frac{8 \times 112}{L}\right) \times \frac{x^2}{2} \text{ lb.-ft.}$$

$M = 4 \times 112 \left[x - \frac{x^2}{L}\right]$ which is the equation of a parabola.

At centre $x = \frac{L}{2}$

and BM $= 4 \times 112 \left[\frac{L}{2} - \frac{L^2}{4L}\right] = 4 \times 112 \frac{L}{4} = 112\,L$ lb.-ft.

(R. H., *Fulham.*)

The case is that of a beam supported at each end and bearing a distributed load of 4 + 4 = 8 cwt.

Then bending moment at the centre = maximum bending moment

$$\frac{WL}{8},$$

(where W = load,

and L = length of beam)

The length is not given, so let it equal [illegible] feet

Then bending moment in centre $\frac{WL}{8} = \frac{8 \times 112 L}{8} = 112 L$

i.e., bending moment at centre = (length of beam in feet × 112) ft.-lb.

(B. K., *Hayes.*)

439. Stability of Wall.—How high may water rise on one side of a vertical wall, 9 ft. high, 27 in. thick, of material weighing 143 lb. per cubic foot, before the resultant force at the base of the wall passes outside the edge?

Consider a portion of the wall of width 1 ft.

Total weight of masonry $= 9 \times 2\frac{1}{4} \times 143$ lb. $= 2,836$ lb.

This force acts through the centre of gravity of the wall.

Suppose the water rises x ft. before the resultant force passes outside base. Total force acting on

AB due to water (area of strip of height x ft. and width 1 ft.)

$$\left[\text{pressure on a vertical rectangle} = \text{area} \times \text{depth} \times \frac{x}{2}\right]$$

Pressure at P $= \frac{x}{2} \times 62.3$ lb. per sq. ft. where 62.3 is weight of a cub. ft. of water.

Total vertical force on AB $= \text{area} \times \frac{x}{2} \times 62.3$

$$= \frac{x}{2} \times 62.3 \times \frac{x}{2} = x^2 \times 31.1 \text{ lb.}$$

The force acts at centre of pressure of rectangular strip, at distance $\frac{2}{3}$ depth of water below surface. The resultant passes through the point of intersection of directions of forces P and W. If this resultant passes just through edge E of base, we get the maximum height of water, and resultant of P and W passes through R.

From triangle of forces PWR we see that

$$\frac{P}{W} = \frac{\frac{1}{2}}{\frac{2}{3}}$$

But $P = \frac{x^2}{2} \times 62.3$ lb.

and $W = 2{,}896$ lb.

$$\therefore \frac{x^2}{2} \times \frac{62.3}{2896} = \frac{1}{\frac{2}{3}}$$

$$\therefore x^2 = \frac{9}{8} \times 3 \times \frac{2896 \times 2}{62.3} = 313.7$$

$$x = 6.794 \text{ ft.} = 6 \text{ ft. } 9\frac{1}{2} \text{ in.}$$

Maximum height to which water may rise without resultant thrust leaving the base = 6 ft. 9½ in. (R. H. Fulton.)

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

A meeting of the above association took place at Twickenham on Saturday, the 7th inst., Mr. J. W. Croxford, the president, presiding over a good attendance of members.

The programme for the session was submitted by the president and approved. The subjects selected promise to be very interesting.

The proceedings of the meeting were mainly taken up with discussions on the approval of plans and their relationship with the observation of building by-laws, reinforced-concrete construction, resurfacing roads, and other matters.

The next meeting of the association on December 5th will take place at Twickenham, when a paper on "The Superintendence of Buildings under By-laws" will be read by Mr. E. Wills Assoc.M.Inst.C.E. The meeting on January 2nd will be held at Wimbledon, when an inspection of several important works will be made in the afternoon, to be followed by the meeting of the association in the evening, when Mr. C. H. Cooper, M.Inst.C.E., has kindly promised to read a paper.

Sewage Sprinklers: Catalogues Wanted.—Mr. G. E. Mitchell, inspector of nuisances and sanitary surveyor to the Clare, Suffolk, Rural District Council, would be glad to receive catalogues of sewage sprinklers suitable for a small percolating filter.

Housing Schemes and the Prices of Materials.—In the House of Commons last week attention was directed to the fact that the scheduled prices of materials required in connection with the Middle Ward housing schemes in Lanarkshire had been greatly increased owing to the war, and that the extra cost incurred would make it impossible to fix the rents of such houses on an economic basis. Having regard to the employment which such schemes were giving during the present crisis and to the need for providing adequate housing accommodation at an economic rent in these districts in Lanarkshire where the existing buildings had been already condemned, the Secretary for Scotland was asked whether the increased cost could be met by a special grant to the local authority in charge of the schemes, and thus permit of the work being proceeded with. Mr. McKinnon Wood, in replying, said there was not available any fund from which he could make a grant in the form proposed.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bollington U.D.C. (November 13th. Mr. [illegible]). [illegible]

Coventry T.C. (November 19th. Mr. Edgar [illegible]).—£[illegible] for the purchase of land for the purpose of widening and improvement of Stoneleigh-terrace and Queen's-row respectively, and £180 for the widening and improvement of Stoneleigh-terrace and Queen's-row. Details of the various schemes were supplied by the city engineer, Mr. J. E. Swindlehurst, and there was no opposition to any of the applications.

Hemel Hempstead T.C. (November 10th. Mr. P. M. Crosthwaite).—£5,900 for works of sewerage in Leverstock Green and Adeyfield districts.—The borough surveyor, Mr. W. R. Locke, submitted drawings of the proposed scheme, and gave full details of the proposals. Arising out of an observation by Mr. Hampton (chief inspector, Thames Conservancy) as to the storm overflows, Mr. Locke mentioned that on the previous Friday afternoon ⅝ in. of rain fell in half an hour, and there was no trouble. The water did not get to within 2 ft. of the overflow. The inspector: Are you satisfied with the scheme, Mr. Hampton? Mr. Hampton: I have no objection to it. The inspector: That is something I have never say you are satisfied. (Laughter.)

Leek U.D.C. (November 10th. Mr. M. K. North).—£1,030 for the purchase of land for extensions to gasworks, £2,455 for the construction of new streets, and £410 for the acquisition of land for allotment purposes.—The details of the purchase of land for gasworks purposes were explained by the gas engineer, and Mr. W. E. Beacham, engineer and surveyor, dealt with the construction of new streets, explaining plans and estimates, and the necessity for providing an outlet from the west end of the town to the station. The provision of land for allotments at the west end was also dealt with, and evidence was submitted by the surveyor, who afterwards conducted the inspector over the sites.

Paignton U.D.C. (November 18th. Mr. R. G. Hetherington).—£975 for works of sewerage.—The surveyor, Mr. C. O. Baines, stated that the proposed works included the laying of a 9 in. sewer at a cost of £700.

Penybont R.D.C. (November 12th. Mr. F. H. Tullock).—£2,015 for the improvement of the coast road between Southerndown and the mouth of the river Ogmore. The surveyor, Mr. Ernest Jenkins, said it was proposed to widen and otherwise improve the road at both ends of the village of Southerndown where there are at present very sharp and dangerous corners, and to divert the road at Ogmore-by-the-Sea, so as to avoid the steep hill and abrupt turn which now make the road at this spot particularly dangerous.

Sunderland T.C. (November 17th. Mr. P. M. Crosthwaite).—£21,270 for the purchase of land at Ford for cemetery purposes.—It was stated that the land adjoined the existing cemetery on its west side. The term applied for was sixty years.

Wootton Bassett R.D.C. (November 10th. Major J. Stewart).—£1,200 for works of sewage disposal.—Mr. F. Redman, engineer to the scheme, explained the details. There were 14 acres of land, of which 10 acres would be available. The inspector expressed the opinion that the filter capacity was insufficient, and inquired what the estimated cost would be for the provision of two additional filters. Mr. Redman: It would cost about £150. The inspector said he thought the council would have to do something more before they secured the loan.

APPLICATIONS FOR LOANS.

Ardsley U.D.C.—£2,000 for gas main extensions.

Atherstone R.D.C.—£18,158 for a water supply for Warton.

Bognor U.D.C.—£558 for road improvements.

Brierfield U.D.C.—£7,500 for improvements at the sewage disposal works.

Chapel-en-le-Frith U.D.C.—£3,250 for a water supply for Fernilee and Chapel.

Honiton T.C.—£[illegible] for works of sewerage.

Kingstown (Co. Dublin) U.D.C.—£54,867 for a hous[illegible]

Leeds T.C.—£[illegible] for improvements at gasworks.

Penrith R.D.C.—£[illegible] for the Troutbeck water [illegible]

Raunds U.D.C.—£250 for alterations at the isolation hospital.

Rugby U.D.C.—£810 for a public convenience.

Wilts C.C.—£27,225 for asylum extension, and £2[illegible] additional expenditure on the Salisbury isolation hospital.

LOANS SANCTIONED.

Cheadle and Gatley U.D.C.—£160 for a public [illegible] recreation ground.

Chorley T.C.—£18,750 for vertical retorts and a con[illegible] at the gasworks.

Epsom U.D.C.—£2,000 for works of sewerage.

Exeter T.C.—£3,100 for street improvements.

Falkirk T.C.—£7,000 for electricity extensions.

Kilkenny C.C.—£1,520 for the purchase of steam rolling plant.

Littlehampton U.D.C.—£1,000 for laying out a recreation ground.

Portland U.D.C.—£250 for a cottage at the waterworks.

St. Germans R.D.C.—£1,750 for a water supply scheme.

Skipton U.D.C.—£8,405 for a sewerage scheme.

Swaffham R.D.C.—£1,238 for the provision of workmen's dwellings.

Tottenham U.D.C.—£12,620 for macadam; £206 for excavating and concreting West Green-road; and £412 for wood blocks.

Wells R.D.C.—£1,650 for a housing scheme at Meare.

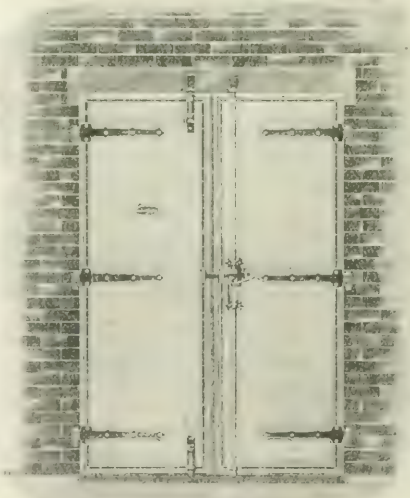
Willesden U.D.C.—£2,617 for road works.

FORTHCOMING INQUIRIES.

		£
	NOVEMBER.	
30.	**Birmingham.** For the erection of public baths (Mr. R. H. Bicknell)	19,262
	DECEMBER.	
1.—	**Aberavon.** For the purposes of street works, water supply, and a recreation ground (Mr. W. M. Cross)	8,088
1.	**Barrow.** For works of street improvement (Mr. Edgar Dudley)	1,625
1.—	**Chailey.** For works of sewage disposal (Mr. R. G. Hetherington)	5,720
1.—	**Croydon.** For works of water supply (Major J. Stewart)	3,000
1.—	**Daventry.** For a housing scheme (Mr. H. S. Stewart)	1,626
1.—	**Prescot.** For the construction of a road (Mr. A. W. Brightmore)	2,900
1.—	**Seaford.** For the erection of workmen's houses (Mr. Courtenay Clifton)	630
1.—	**South Shields.** For works of road improvement (Major C. E. Norton) ...	8,379
1.—	**South Westmorland.** For works of water supply (Mr. W. O. E. Meade-King) ...	650
1.	**Stockport.** For work of road improvement (Mr. R. H. Bicknell)	17,300
2.—	**Andover.** For works of sewage disposal and storm-water drainage (Mr. F. O. Stanford)	1,018
2.—	**Hexham.** For works of water supply (Mr. W. O. E. Meade-King)	380
2.—	**New Mills.** For the purposes of the gas undertaking (Mr. A. W. Brightmore)...	7,000
2.—	**Ogmore.** For the construction of public urinals (Mr. W. M. Cross)	874
2.—	**Porthcawl.** For works of water supply (Mr. W. M. Cross)	8,675
2.—	**Preston.** For work of street improvement (Mr. Edgar Dudley)	6,075
2.—	**Prestwich.** For the erection of working-class dwellings (Mr. W. H. Collin) ...	4,000
2.—	**Ruthin.** For the purchase of the local waterworks (Mr. P. M. Crosthwaite) ...	3,150
2.—	**Watford.** For the provision of workmen's houses (Mr. Courtenay Clifton)...	970
2.—	**Wolverhampton.** For the erection of firemen's dwellings (Mr. H. S. Stewart)	3,165
3.	**Chorley.** For the purposes of street improvement (Mr. Edgar Dudley)	3,250
3.—	**Chorleywood.** For street works and the provision of a soakaway (Mr. F. O. Stanford)	4,073
3.	**Criccieth.** For the erection of workmen's houses (Mr. H. S. Stewart)	3,194
4.—	**East Molesey.** For works of flood prevention (Mr. F. O. Stanford)	600
4.	**Hemsworth.** For the provision of a depot (Mr. Edgar Dudley)	1,960
4.—	**Leicester.** For works of sewerage (Major C. E. Norton)	6,919
4.—	**Mynyddislwyn.** For the construction of a road (Mr. W. M. Cross)	11,351
4.—	**Wellington.** For the erection of a convenience (Mr. P. M. Crosthwaite)	150
	TOWN PLANNING.	
2.	**Hendon.** (Mr. George L. Pepler)	

FIRE RESISTING DOORS.

Messrs. Mather & Platt, Limited, of Park Works, Manchester, are very extensive manufacturers of fire resisting doors and apparatus for automatic closing in case of fire. The firm have just issued a new catalogue of such appliances. In a very compact form the catalogue contains a large amount of information on the subject of fire doors, and gives prices of various types, such as armoured sliding fire doors, armoured hinge fire doors, armoured folding fire



"STRYP" FOLDING DOOR.

doors, and Mather & Platt's own patent "Stryp" fire door. The "Stryp" fire door is of a thinner and more ornamental type than the armoured door. It is constructed on the sliding principle, of steel sheets and asbestos. The temperature may be raised to white heat on one face only or on both without, it is claimed, causing serious distortion. Moreover, if while in this condition a powerful stream of water from a hose pipe is directed upon it and the metal is suddenly cooled, the door will still lie flat against the wall. In their new catalogue Messrs. Mather & Platt give illustrations showing the remarkable efficiency of the fire doors manufactured by them. Views are given of the interiors of various premises entirely burnt out, but with the fire resisting doors standing intact and preventing the spread of the fire to the adjoining premises. All who are interested in the protection of large premises against serious fire should apply to Messrs. Mather & Platt for one of these new lists.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works, of which particulars appear below: Buildings—Dundee, Gourock; housing and town planning—Weymouth; refuse disposal—Perth; roads and materials—Argyllshire, Colwyn Bay, Hants, Pontypool, Southampton; sewerage and sewage disposal—Carlisle, Mansfield; water, gas and electricity—Malvern, Redditch. Particulars of other works projected will be found in our "Local Government Board inquiries" pages.

BUILDINGS.

Accrington T.C.—It has been decided to build a new fire station.

Brighton T.C.—The Tramway Committee recommend extensions to the tramway depot, including an additional working bay and a smith's shop.

Dundee T.C.—The council on Monday gave consideration to the proposed town hall scheme. The city engineer, Mr. James Thomson, submitted plans showing that the total cost would be £370,000, this meeting £100,000 given by Sir James Caird to build the new hall. Of the £250,000 remaining £170,000 was for the purchase of property. It was explained that for the expenditure proposed there would be a city hall, wings for letting purposes, with a large square in the centre, and a public market under the square. The annual income would be £10,990 and the expenditure £13,210, leaving a deficit of £2,220. Ultimately the matter was adjourned for the preparation of a report.

Gourock T.C.—Plans are in preparation for new municipal buildings.

Preston T.C.—The Health Committee have approved a scheme for the purchase of property and its conversion into a sanatorium and hospital. The estimated outlay is £2,000.

Salop C.C.—It has been agreed to promote a Bill for vesting the shire hall and Guildhall, Shrewsbury, in the council, and to authorise the payment to the Shrewsbury Corporation of £12,500 towards a scheme for providing new municipal buildings.

HOUSING AND TOWN PLANNING.

Arklow U.D.C.—A scheme has been adopted for the erection of 100 labourers' cottages.

Athy U.D.C.—It was reported at the council meeting recently that the Treasury had refused to grant a loan of £7,000, which had already been sanctioned, for a housing scheme on the grounds that it was not urgent. Mr. Deegan said the Local Government Board considered the housing question an urgent one. It was also mentioned that the council had formed a Distress Committee at the suggestion of the Local Government Board.

Billinge U.D.C.—The surveyor, Mr. A. Darlington, has received instructions to prepare a scheme for the erection of eight workmen's houses.

Bourne R.D.C. — Upon the application of the Rippingale Parish Council, the council have decided to erect four houses on two sites selected by the sub-committee and to build them of the better class, the clerk to make the necessary application for the loans, and ask for consent to transfer the loan now on hand from the Castle Bytham houses to those to be built at Rippingale.

Chard T.C.—The specification prepared by the borough surveyor, Mr. E. W. Hearn, for the erection of three houses in Old Town in connection with the council's housing scheme has been approved.

Weymouth T.C.—The Local Government Board has been asked to sanction a scheme for the erection of twenty-five workmen's dwellings.

Willington U.D.C. — The surveyor, Mr. J. H. Gardner, and the medical officer of health, having made a visit of inspection to the back-to-back houses in the district, submitted a recommendation that the whole of these be certified as unfit for human habitation. They also suggested that sixty houses should be erected by the council. The matter has been referred to the Works Committee.

REFUSE COLLECTION AND DISPOSAL.

Perth T.C.—The question of the introduction of a refuse destructor is again under the consideration of the town council.

ROADS AND MATERIALS.

Argyllshire C.C.—The council have decided to forward to the Road Board applications for grants in aid of improvement works proposed to be carried out in the various districts of the county, which are estimated to cost £9,332.

Barrow R.D.C.—It has been decided to make use of Quarrite in the main streets of villages in the district subject to the parishes expressing a desire that the roads should be repaired with a tar material.

Buxton U.D.C.—In the course of his half-yearly statement on road repairs, the surveyor, Mr. F. Langley, said that the average life of an ordinary macadam road in Buxton might be taken as seven years, and the cost per yard at 1s. 3d. Tarred basalt work cost 2s. per yard, and the total expenditure would be increased in ratio to the adoption of this class of roadway in each year. The life of the road, however, would be increased, and a saving in repairs and cleansing effected, which would ultimately justify the increased initial expenditure, and for this reason he urged that all level thoroughfares should be resurfaced as required in tarred basalt. He further stated that fully 10 per cent of the 30 miles of footpaths, formed in limestone asphalt, required resurfacing, and he advocated a loan of £2,000 for this purpose.—The council have approved the plans and estimates for two street improvements.

Colwyn Bay U.D.C.—Extensive schemes of road improvement are to be carried out at an estimated cost of £10,000.

Hants C.C.—The council have resolved to spend £6,300 in making good the roads near the military camps at Winchester and Lyndhurst.

Hipperholme U.D.C.—It has been agreed to carry out repairs in Badger-lane, St. Giles-road and Mytholmroad, and application has been made to the Road Board for a grant in aid of the estimated cost (£3,000 to £4,000). With regard to the main roads, communication was opened up with the county council and the Road Board, and those authorities agreed to bear the cost of improvements to the amount of £10,524, provided the work is completed within a year. The urban council have agreed to carry out the work by direct labour.

Holborn B.C.—The council have agreed to a proposition by the London County Council to acquire part of the Inns of Court Hotel for the purpose of widening High Holborn, provided the county council contribute half the nett cost. The total is estimated at £3,000.

Limavady R.D.C.—Subject to the Road Board sanctioning a grant of £2,250, and granting a loan of a similar sum, free of interest it is proposed to improve 6 miles of road from Downhill limeworks to Bellarena Station.

Pontypool U.D.C.—The Pontypool Park and new through main road scheme may now be said to have reached a final stage of approval. The Monmouthshire County Council have adopted the recommendation of the Main Roads and Bridges Committee to contribute one-third of the cost of constructing the new road through the park. The county authority's grant is not to exceed £4,500, and is subject to the sanction of the Local Government Board to a loan for the purpose. The Road Board has already promised a grant of £5,769, representing one-third of the estimated cost of the scheme (£17,306), and has undertaken, should the actual cost of the works exceed the provisional estimate, favourably to consider an application for an additional grant in proportion to the actual expenditure. Two other local authorities besides the Pontypool Council will also share the cost.

Ramsgate T.C.—A scheme has been agreed to for making up the footpaths of Boundary-road and paving the carriageway with wood blocks.

Rochester T.C. [illegible] and of main roads 1·33d. per square yard, 30,800 [illegible]

St. Pancras B.C. [illegible] road.

Southampton T.C. [illegible] foundations of a number of roads, and the council [illegible] cost, as well as £18,962 for improving the surface of such roads.

Tilbury U.D.C.—The surveyor, Mr. S. A. Hill-Wilkie, has [illegible] with the construction of the road from Tilbury to the Orsett [illegible]

West Sussex C.C.—The county surveyor, Mr. H. W. [illegible] railways by the Government, there was extreme difficulty in obtaining road materials for carrying out the work embodied in the main Road Board scheme for the year, and that he had had an interview with the board's chief engineer, and had discussed the matter with him, with the result that it was suggested that a scheme of relief works, substituting road improvements and drainage instead of reconstruction involving the use of road metal, should be formulated and put into operation in the event of its being found to be impossible to carry out the original scheme. This suggestion was approved generally, and it was referred to the sub-committee to draw up a scheme in detail for submission to the Road Board.

SEWERAGE AND SEWAGE DISPOSAL.

Carlisle R.D.C. A proposed sewerage scheme for Scotby and Cumwhinton, estimated to cost £7,100, has been referred to the consideration of the parish of Wetheral.

Clutton R.D.C.—The council have approved the scheme of the sanitary surveyor, Mr. R. S. Davey, for a sewage disposal scheme at High Littleton, and he has received instructions to draw up detailed plans, estimates and bills of quantities of the proposed works.

Crompton U.D.C. Sewerage works are to be carried out at Shaw Edge, at an estimated cost of £294.

Hinckley U.D.C.—The Local Government Board have written to the council stating that they could only [illegible] years, in the event of the main being ultimately required for the larger scheme of filtration. Otherwise the term would be limited to five years.

Honiton T.C.—It has been agreed to take up a loan of £4,650 for works of sewerage. The interest on the loan is 4½ per cent.

Mansfield T.C.—The borough surveyor, Mr. T. P. Collinge, has prepared a report in which he recommends various alterations and improvements at the sewage disposal works.

Surbiton U.D.C.—A statement of the cost of the new sewage disposal scheme has been prepared by the clerk, Mr. F. W. Wood, and the surveyor, Mr. H. T. Mather, and this shows that the total expenditure on the scheme was £86,689. Of this amount £1,352 was paid out of the sewer rate. The total of the original loans sanctioned and borrowed was £68,042, so that the excess expenditure incurred amounted to £17,295. The council decided to make application to the Local Government Board for sanction to borrow the amount of the excess expenditure, less the sum of £12,500 already sanctioned on account.

Totnes R.D.C.—While conceding that the sanitary condition of some of the parishes of the rural district is fairly satisfactory, the Local Government Board press upon the council the necessity for several improvements, such as the conversion of privy middens into pail-closets, a scheme of sewerage for Harbertonford, and a closer inspection of the yards and houses in South Brent.

WATER, GAS, AND ELECTRICITY.

Bradford T.C.—The Gas Committee have agreed to a scheme for a new gas [illegible] the Birkshall and Mill-street gasworks. The estimated outlay is £[illegible]

Bourne R.D.C.—The council have agreed to purchase the local water undertaking with a view to providing a supply for the whole parish of Castle Bytham.

Bungay U.D.C.—Consideration is being given to a scheme for the construction of waterworks.

Cowes U.D.C.—The tender of Messrs. Glenfield & Kennedy, Kilmarnock, at £3,280, has been accepted for duplicate pumping machinery at the waterworks.

Dumbartonshire C.C.—For the improvement of the Vale of Leven water supply the Western District Committee have agreed to apply to the county council for powers to carry out the following works—viz., laying larger pipes in certain districts, at an estimated cost of £3,950; laying a 14-in. main from Balloch Loan to the reservoir, at an estimated cost of £3,750; and the continuation of the supply, at an estimated cost of £1,100.

Kidderminster R.D.C. The Local Government Board have sanctioned the proposal of the council to carry out the necessary work for supplying the parish of Wribbenhall with water from the Bewdley waterworks.

Kirkconnel T.C. The scheme for augmenting the Kirkconnel water supply which includes the laying of a new track from Kello water to the present main at Kellobank, has now taken practical shape. Mr. James Ritchie, Dunfermline, has secured the contract for laying the main at an estimate of £2,622. The fixing of the mechanical filters and filtration plant has been entrusted to Paterson's Engineering Company (Limited) at £370, and the reinforced cement tank will be built by Gray's Ferro-concrete Contracting Company, Limited, at a cost of £479. The aggregate cost is estimated at £4,500.

Lanarkshire C.C.—The council have given notice of their intention to make application to the Secretary for Scotland for a Provisional Order for power to carry out an extension of the waterworks of the Middle Ward and for other purposes. The Order includes provisions for the construction of a service reservoir to the west of Airdriehead Farm, in the parish of Cumbernauld, and a number of aqueduct conduit lines of pipes connected with the proposed extension. It is proposed to extend the water supply so as to include portions of the parishes of Cumbernauld and Kirkintilloch in Dumbartonshire.

Llangollen U.D.C.—The council have instructed Messrs. [illegible] Smith & Wells, [illegible] engineers, of Wolverhampton and Westminster, to report on the water supply of the town.

Macclesfield T.C.—The Gas Committee have decided to carry out extensions at the gasworks, at an estimated cost of £700.

Malton R.D.C.—The council have resolved to adopt a water supply scheme prepared by Mr. J. Hutton, engineer, for the following parishes: Broughton, Swinton, Amotherby, Appleton-le-Street, Barton-le-Street, Slingsby, Fryton, Butterwick, Brawby, Little Habton, Great Habton, Hilderdey, and High and Low Hutton. The estimated cost is £14,966.

Perth T.C.—It is proposed to effect extensions of the gas mains to [illegible] and West Huntingtower, at an estimated cost of £500.

Redditch U.D.C.—The council recently decided to carry out an extensive scheme of reconstruction at the electricity works, involving an expenditure of £18,000. The Birmingham Small Arms Company subsequently approached the council asking for a supply of current for power purposes for ten years, the maximum demand amounting to 2,000,000 units per annum. To meet this increased demand a further sum of £10,000 is to be spent upon plant, bringing the total expenditure to £28,000.

Tenby T.C.—The Sanitary Committee have approved of the draft notice of the intention of the council to apply to the Board of Trade for a Provisional Order authorising an electric lighting scheme for the town.

MISCELLANEOUS.

Doncaster T.C.—The council have agreed to the provisions of the local Bill proposed to be promoted by the corporation in the ensuing Session of Parliament referring to the extension of the gasworks, gas area,

and gas clauses; streets improvements, streets, buildings, sewers, drains, infectious diseases and sanitary matters; the infectious diseases hospital; the Donnington cemetery, new municipal offices, and other objects.

Skipton U.D.C.—It has been resolved to purchase a motor tender for the fire brigade at £15 15s., and [illegible] the electric [illegible] from Messrs. Stewart & Moore, the [illegible] and telephones similar to those in use at Bridlington.

PERSONAL.

Mr. J. W. Pike, surveyor to the Pontypool Rural District Council, has been appointed surveyor to the Holsworthy (Devon) Rural District Council.

Mr. Frank Sumner, M.INST.C.E., chief engineer to the Corporation of the City of London, has been granted a further three months' leave of absence on account of illness.

Lieutenant-Colonel W. Collingridge, M.A., M.D., [illegible], the medical officer of health to the City and Port of London, was called to the Bar on the 17th inst. as a member of the Honourable Society of Gray's Inn.

Mr. G. E. Mitchell, sanitary surveyor and inspector of nuisances to the Clare, Suffolk, Rural District Council, has been voted ten guineas for the preparation of plans and specifications of workmen's dwellings at Rougham, and the supervision of the scheme.

Mr. G. Gledhill, late surveyor to the Balby Urban District Council, whose area has been incorporated in the borough of Doncaster by the recent extension scheme, was recommended by the Doncaster Corporation meeting in committee for a salary of £300 per annum.

Mr. W. Laurie, late assistant county surveyor of Stirlingshire, has been appointed temporary county surveyor and engineer to the Western District Committee of the Perthshire County Council, in the room of Mr. W. L. Gibson, who has been gazetted a Lieutenant in the Scottish Horse.

Mr. G. A. Penwill, surveyor to the Peterborough Rural District Council, was, at the last meeting of that body, granted £100 for preparing and carrying out housing schemes in the parishes of Walton and Eye. He was also voted £20 a year towards the upkeep of a motor cycle, and is to receive 1½ per cent on all works costing over £200.

Mr. George Sheppard, late borough surveyor of Newark, died, we regret to announce, on Saturday last. Mr. Sheppard, who was a native of Newark, was appointed borough surveyor in 1876, and resigned in June, 1912, when he was appointed consulting surveyor. He was a partner in the firms of Messrs. Sheppard & Pink, auctioneers and valuers, and Messrs. Sheppard & Lockton, architects.

Mr. G. Bertram Kershaw, M.AM.SOC.C.E., has terminated his appointment as engineer to the Royal Commission on Sewage Disposal, and has taken [illegible] Westminster, with a view to devoting [illegible] time to a private practice, embracing sewerage, sewage purification and disposal, treatment of trade wastes, and river pollution problems. Mr. Kershaw has had a very wide and varied experience in all matters relating to sewage and trade wastes. Formerly assistant to Messrs. John Taylor, Sons & Santo Crimp, he has for the past sixteen years been [illegible] to the Sewage Commission, whose ninth and tenth (final) reports are now on the eve of publication; he has carried out work both in this country and abroad, and has [illegible] "Modern Methods of Sewage Purification" has had a wide circulation at home and abroad, and his latest book on "Sewage Purification and Disposal" (Cambridge Public Health Series) [illegible] will be published [illegible] shortly.

Institution of Civil Engineers. A paper entitled "Concreting in Freezing Weather and the Effect of Frost upon Concrete" will be read by Mr. J. Hammersley-Heenan, ASSOC.M.INST.C.E., at a meeting of this body on Tuesday evening next.

Asphalting.—The order for the asphalting at the extensions to the National Gallery under H.M. Office of Works has been placed with Claridge's Patent Asphalte Company, Limited, of 3 Central Buildings, Westminster. This firm also have in hand the asphalting of the places for the New Zealand Government, 413 Hi Strand and Royal Mews, Buckingham Palace.

Institution of Municipal Engineers.—Mr. R. J. McKenn, hon. secretary of the North-Western District of this institution, writes that he has arranged for a visit to be paid to the flag-making department and electricity works of the Salford Corporation on Saturday, December 12th. The flag-making works are a new undertaking, and are worked in conjunction with a branch of the destructor works at Salford. The electricity works are full of interest, and the new turbo-generator which has been installed, and which is capable of developing 5,000 k.w., will be in operation. The Mayor of Salford and the respective committees of the above departments have offered to provide tea at the Salford Town Hall, and to give the members the use of the Mayor's Banquet Chamber for a social which will be held in the evening, and which will be attended by his Worship.

Housing Loans.—In the House of Commons on Tuesday, Mr. Lloyd George stated, in reply to a question, that in view of the exceptional conditions now prevailing and cost of building, the Treasury would, in the case of local authorities, be prepared, under the Housing (No. 2) Act, to make advances for schemes approved by them on the recommendation of the Local Government Board or Board of Agriculture on the following terms: 10 per cent of the approved capital cost by way of free grant, the remaining 90 per cent by way of loan with interest at 4¼ per cent per annum, to be repaid by equal annual instalments of interest and principal combined within the period usually authorised for the works of the nature of those for which the loan was required. On a sixty years' loan the authority would thus pay for each £100 of approved capital cost an annuity of £4 3s. 4d.

FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF CHELMSFORD.
BOROUGH ENGINEER'S DEPARTMENT.

Applications are invited for the following appointment:—

(a) Temporary Junior Draughtsman; salary 25s. per week.

(b) Temporary Clerk; salary 20s. per week.

Previous Municipal experience desirable, but not essential.

Applications, in candidate's own handwriting, stating age and experience, and accompanied by not more than three recent testimonials, endorsed "Temporary Draughtsman" and "Temporary Clerk" respectively, to be sent to the undersigned on or before Wednesday, 9th December, 1914.

PERCIVAL T. HARRISON, A.M.I.C.E.,
Borough Engineer.

Chelmsford.
November 25, 1914. (2,120)

WEST SUFFOLK COUNTY COUNCIL.

Applications are invited for the appointment of a General Clerk in the County Surveyor's Department, to take charge of the clerical work of the office during the period of the war. Applicants must be expert shorthand writers and typists, and preference will be given to one having experience in a surveyor's office.

Applications, in candidate's own handwriting, stating age, salary required, and enclosing copies of three recent testimonials, and endorsed "General Clerk," to be sent to the County Surveyor, Shire Hall, Bury St. Edmunds, before 10 a.m., 7th December, 1914. (2,118)

WANTED temporarily during the continuance of the War, an Assistant in the Office of a Surveyor to a County Borough. Must be a good draughtsman, with knowledge of Surveying and Levelling. Applications to be sent, with copies of three recent testimonials, and stating age and salary required, to Box 1,491, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,123)

COUNTY BOROUGH OF CROYDON.

SEWAGE WORKS EXTENSION—SOUTH NORWOOD FARM.

UNDERDRAINAGE TILES.

Notice is hereby given that the Council are prepared to receive Tenders for the Supply of about 1000 square yards of Underdrainage Tiles for the New Percolating Filters at the Sewage Disposal Works, South Norwood Farm.

Conditions, Particulars, Specification, and Form of Tender may be obtained at the Borough Engineer's Office, Town Hall, Croydon, upon payment of a deposit of One Guinea, which will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, on the prescribed Form, to be sent to me by eleven o'clock in the forenoon of Monday, the 7th day of December, endorsed "Tenders for Underdrainage Tiles—South Norwood Farm."

Tenders will only be received subject to the terms of the draft Contract deposited at my Office, and which may be inspected during office hours.

The Council will not be bound to accept the lowest or any Tender.

JOHN M. NEWNHAM,
Town Clerk.

Town Hall, Croydon.
November 24, 1914. (2,125)

KIDDERMINSTER RURAL DISTRICT COUNCIL.

WRIBBENHALL WATER SUPPLY.

The above Council are prepared to receive Tenders for the Construction of about Three Miles of Cast-iron Water Mains, principally of 4 in. and 3 in. diameter, together with the necessary Bends, Branches, Sluice Valves, Hydrants, Meters, Meter Chambers, and other work incidental thereto.

Plan and Sections of the proposed works may be seen, and Specification and Bill of Quantities obtained from the Offices of the Engineer to the Council, Mr. William Fiddian, F.S.I., Stourbridge, on and after the 30th inst., on deposit of a cheque for Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender with the Specification and the Bill of Quantities duly priced in.

Two approved securities will be required for the due performance of the Contract.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender, Wribbenhall Water Supply," to be sent to the undersigned not later than noon on the 14th proximo.

(By order)
F. E. BURCHER,
Clerk to the Rural District Council.

Kidderminster.
November 25, 1914. (2,116)

KIDDERMINSTER RURAL DISTRICT COUNCIL.

CHURCHHILL WATER SUPPLY.

The Kidderminster Rural District Council invite Tenders for the Provision, Laying, and Jointing of about 1,587 yds. of 3-in. Cast-iron Water Mains, together with Meters, Valves, Hydrants, and other Fittings; the Construction of Meter Chamber, and other Incidental Works, in accordance with the Drawings and Specification prepared by the Engineer.

Drawings and Specifications may be seen, and Bills of Quantities and Form of Tender obtained at the Office of the Engineer, G. J. Shepherd, 85 Chester-road, Kidderminster, on or after the 1st day of December, 1914, on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all Documents to the Engineer.

Sealed Tenders, endorsed "Churchill Water Supply," to be delivered at my Office not later than Twelve o'clock noon on the 14th day of December, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

F. E. BURCHER,
Clerk to the Kidderminster Rural District Council.

Bank Buildings, Kidderminster.
November 25, 1914. (2,117)

EPSOM URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the following works at their Sewage Farm, Hook-road, Epsom:—

Contract No. 1. Additions and alterations to the Destructor Buildings, Engine-room, &c., with Air-compressing Machinery and Sewage screening Apparatus.

Contract No. 2. Refuse Destructor.

Contract No. 3.—Two Hydrolytic Tanks, alterations to Settling Tanks, laying of Cast-iron Mains, construction of Ejector Station and Carriers.

Plans and Specifications may be seen and Quantities and other particulars obtained on payment of a deposit of Three Guineas for each set of Quantities (which will be returned upon receipt of *bonâ-fide* Tenders) upon application to Mr. Edward R. Capon, Surveyor, Bromley Hurst, Church-street, Epsom, on or after Monday, November 30, 1914.

Sealed Tenders, endorsed "Eleventh Asylum Scheme," "Contract 1, 2, or 3," as the case may be, to be delivered to the Clerk to the Council, "Duncannon," Church-street, Epsom, before 7.30 p.m. on the 15th day of December, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

E. G. WILSON,
Clerk.

November, 1914. (2,121)

SLEAFORD RURAL DISTRICT COUNCIL.

WORKS OF WATER SUPPLY.

The Council hereby invite Tenders for Providing and Laying of about Six Miles of 4-in., 3-in. and 2-in. diameter Cast-iron Mains; Construction of a Brick Tower; Cast-iron Reservoir, and other Works of Water Supply, for the Parishes of Ewerby, Evedon, Haverholme Priory, Kirkby-la-Thorpe and Anwick.

Plans may be seen, and Bills of Quantities with Form of Tender obtained from Mr. W. B. Marsden, Engineer and Surveyor to the Council, at 74 Southgate, Sleaford, on or after the 4th December, upon making a deposit of £2, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders will be received by me, endorsed "Ewerby and Anwick Water Supplies," not later than the 24th December, 1914. The Council do not bind themselves to accept the lowest or any Tender.

ERNEST H. GODSON,
Clerk to the Council.

Northgate, Sleaford.
November 25, 1914. (2,122)

CITY OF BIRMINGHAM.

COAL-GAS TAR.

The Public Works Committee are prepared to receive Tenders for the Supply of about 1,500 tons of Coal gas Tar to be delivered during the coming Spring and Summer to various Corporation depots within the City, by boat, rail, or road, as circumstances permit.

Tenders may be given for the whole quantity of 1,500 tons, or any less quantity.

Specification and Form of Tender may be obtained at the Office of the undersigned, where Tenders, endorsed "Tenders for Tar," are to be delivered by Tuesday, 15th December, 1914. The Corporation do not bind themselves to accept the lowest or any Tender.

HENRY E. STILGOE, M.INST.C.E.,
City Engineer and Surveyor.

The Council House, Birmingham.
November 25, 1914. (2,119)

BOROUGH OF CHEPPING WYCOMBE.

The Corporation invite Tenders for the Construction of a Ferro-concrete Bridge on the Hennebique system, and the laying of a short length of Sewer and Surface-water Drain.

Plans and Specification may be seen, and Form of Tender and Quantities obtained, on payment of One Guinea, at the office of the undersigned, to whom Tenders, endorsed "Desborough-avenue Extension," must be delivered not later than January 5, 1915.

T. J. RUSHBROOKE,
Borough Engineer and Surveyor.

Borough Surveyor's Office,
Easton-street,
High Wycombe.
November 25, 1914. (2,124)

Concrete Institute.

PROF. HENRY ADAMS' PRESIDENTIAL ADDRESS.

[illegible] Prof. Henry Adams [illegible] the [illegible]

[illegible] Prof. Adams [illegible] This was in accordance with the custom which had obtained in the institute since its foundation, but in these democratic days he was doubtful whether such [illegible] was consonant with the trend of public opinion. He would rather see the nomination of president and vice-presidents submitted to the vote of the general body of the members. This matter was under the consideration of the council, and he hoped that the various alterations in the Articles of Association [illegible] which the members all over the world could take part in the elections, not only of the chief officers, but also of the council generally.

The [illegible] was, it is happy to say, in a very flourishing condition. There were at present on the roll sixteen honorary members, 933 ordinary members, twenty-seven associate members, six associates, fifty-one students, and five special subscribers. Although the numbers were for the present satisfactory, it must be remembered that there was a constant outflow due to deaths and resignations, and that merely to maintain the *status quo* about fifty new members were required each year. With a young and progressive institute like this there ought to be no difficulty whatever in doubling this number, and as the influence of the institute and its capability for benefiting its members increased with every addition to the membership, it was to be hoped that efforts would not be slackened until the 2,000 was reached.

The unfortunate war now in progress had already had the effect of checking building enterprise, and it might be some considerable time before a recovery took place; but, beyond this, the call of the nation for volunteers to join our Army and take part in the defence of our coasts must have a depressing effect upon the membership roll, and it would be no cause for wonder if there should be a temporary falling off.

Their financial position was satisfactory, although last year their expenses exceeded their income by a small amount. The annual subscription, notwithstanding it having been increased, was still below the average of other institutions, but the council considered that it would be sufficient to carry on the ordinary work and leave a small margin for developments. When their funds increased there were many useful directions in which they could employ the surplus.

A library was in course of formation, and a catalogue would shortly be issued. The new methods of construction were developing so rapidly that a constant study of the literature of the subject was necessary, and the council wished to give every facility to the younger members to improve themselves at a minimum cost. Naturally, some of these younger members were too diffident to join in the discussion at the ordinary general meetings, and the council had therefore inaugurated a series of informal monthly meetings for the junior members only, at which a member of the council took the chair, and friendly discussions ensued upon a subject announced beforehand, or upon a short introductory lecture given by one of the members. As far as possible the activity which characterised the last year's work would be fully maintained during the coming year; but the war must affect the institute and the work of its members in one way or another, so that, without endeavouring to foresee the ultimate results, I would say that for the present their motto was, "Business as usual."

THE LONDON REGULATIONS.

"The extreme importance of the official 'Regulations for the Use of Reinforced Concrete' in London, in the preparation of which this institute, with other bodies, was consulted, has," Prof. Adams continued, [illegible] of time and anxious thought to the discussion of the various propositions during the last five years. While they desired to place no difficulty in the way of sufficiently safeguarding the public in the use of this method of construction, they were, on the other hand, in duty bound to their members to see that no unnecessary restrictions were placed upon it. For the first time in history the authorities have suggested an alteration in the laws of mechanics in order to provide against bad workmanship, and I cannot help thinking that this is a mistaken method of securing safety, and in any case the formulæ should have been relegated to an appendix. What would be thought if, in the Steel-frame Building Regulations, incorrect bending moment formulæ were given by which the girders were to be calculated to compensate for insufficient riveting to resist shear? In that document results only are stipulated for, the stresses being assumed to be calculated by the ordinary laws of mechanics.

"In M. Bohny's paper on 'The Bending Moments of Beams with Various Degrees of Fixity,' the matter was summed up as follows: 'It appears obvious to me that an engineer or architect who may be called upon to apply regulations concerning reinforced concrete should have sufficient knowledge of the laws of mechanics to be able to deal with the various problems which he may have to study; and to oblige him to follow certain formulæ would practically imply that he is incapable of exercising proper control of any scheme or problem in reinforced concrete which he may have to consider.'"

They were probably well aware that the actual distribution of stress in a complete structure could only be approximately estimated, and that reliable data for constructional work could only be slowly gathered by extended experiments and minute measurements of the induced strains, which took both time and money; but until we have more precise knowledge he maintained that if we adopted the accepted laws of mechanics we should not go far astray. He must not say any more about these Regulations at present, as they were still *sub judice*, but he did hope that when they appeared they would be in a form to command respect as well as compliance. He would, however, just add that in the last proof that had been received, out of eighty-seven suggestions made by this institute, sixty-five had been adopted, and there was some ground for hoping that the final revision would include a good proportion of the outstanding [illegible] They were assured that facilities would be given for revision from time to time after the Regulations have been tested in practice.

LESSONS FROM FAILURES.

If the Concrete Institute had emphasised one thing more than another in connection with the materials the members were interested in, it was the necessity for the best possible workmanship and the utmost care in supervision. The majority of the failures that had occurred have been due to improper materials or careless workmanship. Part of the secret of good work was good pay for it. Where labour was cheap the output was poor both in quality and quantity.

"In my remarks upon the subject at the International Congress of Architects eight years ago I paraphrased," the president continued, "the old saying that 'Nothing succeeds like success' by 'Nothing succeeds like failure,' because I believe that a proper study of failures will do more than anything else to ensure success. In 1912 the Concrete Institute formed an 'Investigation Committee' for the purpose of studying failures as they occurred, but the natural desire of all parties concerned to hush up the failures has prevented the committee so far from doing much useful work, unless the fact of its existence acts as a bogey to frighten the careless operative. It may be well to remind you that a schedule has been drawn up for recording the details of such failures as are brought to the notice of any member, and all such schedules are treated as confidential by the committee unless permission is given by the parties concerned to make public use of them. It is the misfortune of engineers that their success-

[illegible] meet freely within the walls of our institute lies undoubtedly in the fact that the subjects discussed have similar interest for both. There is a sort of neutral zone in reinforced concrete construction where the engineer and architect are equally at home, and this alone renders our institute unique in its membership.

"The scientific principles of reinforced concrete and structural mechanics are now so well known that the failures due to ignorance on the part of the designer are conspicuous by their absence, but frequently there are failures reported which are due to the formwork being badly designed and fixed or removed too early. Too often these matters are left to the foreman carpenter, and however conscientious he may be, his goodwill is no substitute for experi- [illegible] an exceptionally good motto for us and our work. Near Auburn, California, a reinforced-concrete bridge in three spans was under construction towards the end of last year. The work was being rushed day and night by the contractors in order that it might be finished before the river rose, and on the night of November 4th the formwork under one end span collapsed, allowing the whole mass to fall, killing some of the workmen and injuring several others."

In engineering works, such as reservoir dams, other causes of failure had been found, one of the most remarkable of which was the action of alkali on concrete. Where junctions occurred between successive portions of the work, a leakage was most likely to take place, and if any alkali existed in the earth resting against the wall which the leakage could reach, a very rapid disintegration of the concrete was found to take place.

A DIFFICULTY.

A curious objection had been taken to building in reinforced concrete, which was that it was so difficult to pull down. It was frequently said that it cost more to destroy a building than it did to put it up.

"It must be admitted that this method of building does not lend itself readily to alterations, and although I have not personally come across a case where this has been a serious matter, there is a recent instance in Germany where some concrete vaults which had to be removed cost twice as much to destroy as they had cost to build. In some other cases it has been found that only by recourse to blasting operations has it been possible to break up the work in this material, but the imperishable character of the structure and the small cost of upkeep are really very great points in its favour. Their inherent strength and the nature of their stability render these buildings peculiarly suitable to withstand vibration, and even earthquake, whereas ordinary construction is only stable while at rest, and the slightest earth tremors may have a disastrous effect."

Brickwork was one of the best fire-resisting materials, but a building cannot be erected in brickwork alone, and considerable loss of life had occurred in fires from the walls falling, as they ceased to receive the support of the floors and roofs. Reinforced concrete, on the other hand, could be used not only for the walls, but for the floors and roofs also, and the steelwork, which was often the cause of the greatest danger in a brick building, was so protected by the concrete that the fire had practically no effect upon it. Limestone must not be used in the aggregate, as that burnt to pure lime in a fire and swelled and disintegrated when water came upon it. Coke breeze as an aggregate was found to stand fire well in the experiments made by the British Fire Prevention Committee, and for that reason had been largely used by architects; but coke breeze had sometimes a deleterious effect upon the steel reinforcement, and was liable to swell in damp situations or if water reached it. An indication of the value of reinforced concrete was given in the fact that a lower premium is asked by the Fire Insurance Committee for buildings in this material provided the floors were not less than 5 in. thick and the walls not less than 6 in. thick.

EARLY TROUBLES.

It was interesting to look back upon some of the troubles that faced the early workers in reinforced concrete, and to see how such troubles had been sur- [illegible] in the early days of reinforced concrete building was the occurrence of cracks in the finished work. Some of these were undoubtedly due to over-limed cement and to coarse grinding, but the improvement effected by the publication of the Standard Specification of Portland Cement and the endeavour of manufacturers to keep up with it, and even to surpass it, had virtually eliminated this cause of trouble.

"A still frequent cause of cracking is shrinkage upon the drying out of the moisture, but a remedy for this has been found in what is called 'temperature reinforcement,' which consists of the insertion of light rods—say ¼-in. diameter and not more than 12 in. apart—in the opposite direction to the main reinforcement and near the surface, whereby the shrinkage, being confined within these limited areas, is so slight as to be invisible. Other causes are sudden changes of thickness, changes in the composition of the concrete, local currents of air upon the concrete while setting, insufficient reinforcement allowing deformation to occur, &c. Where the new surface is exposed to the sun the changes of temperature are apt to cause 'crazing,' particularly where the surface skin is richer in cement than the body of the work. The best remedy for this is, perhaps, to brush the surface with hydrochloric acid and then wash it with clear water.

"Another cause of early difficulty was the uniformity in size of the larger aggregate. When the maximum of 1½ in. was reduced to 1 in. it was thought that this would be effective in producing solid concrete capable of being packed closely round the reinforcement; but tests showed that it was necessary to grade the aggregate from ¼ in. to ¾ in. to make sure of obtaining a solid concrete without voids, and in perfect contact with the steel. In the same way the sand was found to produce better work when it was not of uniform size, but graded from $\frac{1}{32}$ in. to $\frac{1}{16}$ in. As the cement has to envelop every particle of the aggregate, and cement one to the other, the grading involves the use of a smaller quantity of cement as the voids are small, and also reduces the waste of aggregate as nothing but dust has to be thrown away."

EXPERIMENTAL WORK.

Much valuable work had been practically lost because of the difficulty of co-ordinating experiments made with different materials under varying circumstances. An important suggestion had been made by one of their members—Mr. John A. Davenport—that for some time to come all experiments on reinforced-concrete beams, columns, and similar structural members should be made on a standard steel and a standard concrete. By "standard steel" was meant one having a particular ultimate strength, yield point, elongation and contraction; these could vary between limits, but the variation should be kept small. By "standard concrete" is meant one made of one particular coarse material, one particular sand, and one particular cement, always mixed in the same proportion with the same amount of water. The coarse material should always have the same sizes and grading, and the sand should likewise have definite sizes and grading, which must always be the same. We should then be able to decide definitely many of the points which were the subject of lengthy discussions during the preparation of the Local Government Board regulations—for example, what constituted fixed ends to beams, what width of floor slab should be taken as the flange of a T-beam, what was the actual economy of double reinforcement, how far a concentrated load might be considered to have spread by the time it reached the reinforcement, the comparative value of vertical and inclined shear stirrups, adhesion between the concrete and the reinforcement, the economical value of deformed bars, &c.

After referring to the fact that a Joint Committee of the Concrete Institute and the Quantity Surveyors' Association had prepared a synopsis of a "Standard System of Measurement for Reinforced-concrete Work" which would greatly facilitate uniformity in the preparation of bills of quantities, and reduce the risk of errors of misunderstanding and consequent disputes, the president went on to remark that the council had in hand a standard specification for reinforced concrete which was nearing completion, and that if more uniformity in drafting specifications for such work could thereby be obtained, there would be more certainty in the tendering and a greater absence of sporting items.

PREPARATION OF DESIGNS.

It might be useful to [illegible] for what was the usual method [illegible] for the structural parts of a proposed reinforced building, and [illegible] was [illegible] doors and windows, and positions of stairways, lifts, &c., [illegible] the height of each floor. He then obtained designs and estimates from a certain number of firms who devoted themselves to this class of work, but were each identified with a particular detail of construction, and, selecting the offer which he considered the most suitable and economical, completed his own [illegible] for approval. Now the [illegible] Does this method lead to economy, and is it [illegible] The designs so obtained, being competitive, are naturally based upon the minimum requirements of safety, and leave no margin for accidental errors or faulty material or workmanship, as, [illegible] the [illegible] possible [illegible] I do not mean this as any reflection upon the skill or honesty of the specialists [illegible] but it is not in human nature to provide more than the bare necessity of the case demands when the success of the tender depends upon the cost being kept down to a minimum. The Institution of Civil Engineers has recently issued a circular deprecating the preparation of designs in competition. As a consulting engineer, I may perhaps be biassed, but I am of opinion that collaboration between the architect and the structural engineer is the preferable course, so that a single design may be prepared upon which contractors may tender upon a common basis. Against this it is often said that engineers' designs are expensive, and that there is no advantage in calling in an independent expert to prepare the design; but I think it will generally be found that the additional cost is due solely to a larger amount of reinforcement than appears in competitive designs, with the result that the building gains in greater stability."

There was another aspect of the case, and that was that when several designs were submitted the cost of the unaccepted designs had to be met somehow. It increased what they might call the establishment charges, which must be met by a percentage added to the actual cost of all work, and the only advantage appeared to be that with many men working upon the same scheme some one among the many might evolve a better result than one man alone would be likely to do.

LOCAL GOVERNMENT BOARD'S ATTITUDE.

The Local Government Board were responsible for retarding the progress of reinforced concrete to a very great extent. Many structures that would have been put up in that material had not even got so far as the design, because of the known opposition of the Board and the heavy expense thrown upon the promoters by reason of the short period for which a loan would be granted. They had fixed no actual periods for loans for the various classes of work, as each case was considered on its merits, having regard to the purpose of the work and its position, but they [illegible] from ten years when the work was in contact with water to thirty years in the floors of a building.

If there were any reasonable doubt as to the probable duration of reinforced-concrete structures in general, the council of the Concrete Institute would be the first to know it, but they had the evidence of their own personal investigations that it exceeded fifty years, and they did not hesitate to advise its use where that was not hampered by the consideration of a loan through the Local Government Board. When the Eddystone Lighthouse was pulled down in 1884 a bundle of iron rods which had been accidentally left in the concrete foundation in 1757 (127 years) was found to be in perfect condition, and one would have supposed that was in a sufficiently exposed situation to prove the safety against corrosion.

"Within my knowledge," continued Prof. Adams, "the construction of a large reinforced-concrete seaside pier was quite recently abandoned after completion of the designs because the Local Government Board would only allow ten years for the repayment of a loan for its construction. In another case the Local Government Board refused to allow more than ten years for the repayment of a loan of £10,000 for a reinforced concrete storage tank. The tank was then [illegible] £1,750 [illegible] allowed twenty-five years for the loan, so payment, making the annual charge £880, as against £1,233 which would have been required for the less costly tank on the ten years' basis. Had twenty-five years been granted in the first case, the annual charge would only have been £640.

"Fortunately, there are many cases that do not depend upon official mercy. A sea wall, 300 ft. long, in reinforced concrete has just been erected at Carnarvon by the Harbour Trust in extension of an existing masonry wall, to afford increased wharfage for oil-tank steamers and to reclaim about 2 acres of the foreshore. The existing heavy masonry structure, 20 ft. high from shore to coping, rested on a foundation 6 ft. below shore level, and it was [illegible] to construct the extension in a similar manner. There were many ingenious features in the design carried out, but the point I want to make is that the cost of this work in reinforced concrete was about £2,000, while the lowest tender for a masonry wall was £4,600. The corrosion of the reinforcing rods when the concrete is in contact with water, fresh or salt, continuously or intermittently, is only possible under exceptional circumstances."

STRUCTURAL ENGINEERING.

So much had been said lately about structural engineering, and so many persons seemed to be in doubt as to what was meant by it, that he should like to devote a short time to its consideration.

It was a great mistake to suppose that it consisted of steel-framed buildings only; that was merely one branch of a very large subject. Reinforced concrete was another branch—a very large one, and possibly the main stem, at least for them. These two forms of construction would in the future, so far as they could foresee, constitute the chief work of the structural engineer; but buildings in other materials—wood, stone and brick—came under the head of structural engineering when the chief object is stability. Bridges, towers, jetties, retaining walls, roofs, tanks, reservoirs, dams, and many other structures would come under this classification, and it was to enable them to deal with all these in their papers and discussions that the council had endeavoured to broaden the scope of the Concrete Institute. Bridges alone should be a fertile subject. So many examples had now been completed in reinforced concrete that they could form a fair idea of the value of that mode of construction. It had a distinct advantage over brickwork and masonry in being able to resist tensile stresses and changes of compression and tension due to rolling loads.

No one type was predominant, but the arch entered into most of them. An arch was not only a pleasing form of construction, it was based on sound scientific principles, and was an economical disposition of material.

"I have considerable doubt whether it is desirable to construct hinged arches in this material, whether two-hinged or three-hinged. It appears to me that it is almost equivalent to using simply supported girders when you have the opportunity to make them continuous. There is, of course, the advantage that the line of thrust must pass through the hinges, but there is no difficulty in so proportioning an ordinary fixed arch that the line of thrust nowhere unduly leaves the thickness provided. It may be said that no one knows the exact course of the line of thrust, but we know that Nature takes the course of resisting a load with the minimum of stress, and we shall not be far wrong if we take the line of thrust so that the extreme stresses on the opposite haunches are as nearly equal as possible. The favourite method of construction seems to be a flat or cambered floor with cross and main beams and pillars from the main beams to the arch itself, the arch being a continuous sheet or ribbed sheet; when the latter the pillars are braced transversely, and the arch is stiffened by a repetition of main and cross beams similar to those under the bridge floor. In this work, as in all arches, it is necessary to provide rigid abutments, but reinforced concrete will withstand a shifting abutment better than any other material."

ROAD BRIDGES.

The general movement that had taken place throughout the kingdom to improve the high-roads had not gone so far as it might have done in the direction of improving the existing bridges. As reinforced concrete was such an admirable mode of construction

[illegible] classes. They collected information from all parts of the country [illegible] traffic, and decided what maximum loads each class of bridge should be rated to carry. Their labours were [illegible] would be able to produce a single chart that would reduce the draughtsman's labour to a minimum.

[illegible]

In his concluding observations the president stated that the Science Committee had for a long time past endeavoured to gather useful information upon the driving and supporting power of reinforced-concrete piles, but so far they had not been able to collect sufficient material for a report. Records of the weight and fall of ram, number of blows, and distance driven were very numerous, but comparatively useless. Sometimes the records were accompanied by particulars of a test, when the pile sustained a given load without yielding, but whether it would have yielded with ten or twenty times the test load they had no means of knowing. What was required was a series of experiments with small piles—say, 10 in. square, 20 ft. long—driven 15 ft., and then loaded until they sank farther. That would do for a beginning, and would enable them to compare reinforced-concrete piles with timber piles. He had a collection of about forty formulæ for the latter kind, all more or less unreliable, but none at all for the former.

Reinforced concrete had been the means of saving a considerable expenditure of money in the cost of foundations otherwise than by piling. By enabling the pressure to be spread over a considerable area, without much doubt it had, in many cases, enabled buildings to be safely erected upon soil that would have defied the old method of putting in foundations. Concrete rafts had been used for a long time, but until they were reinforced it was not uncommon to find the heavily loaded parts punching their way through the concrete. Perhaps the greatest innovation was possible in connection with bridge foundations, which were often very deep—100 ft. or more below high-water mark.

At the meeting of the Concrete Institute at which Prof. Adams delivered his address a vote of thanks was proposed by Mr. E. P. Wells, seconded by Sir Henry Tanner, past-presidents, supported by Mr. E. Fiander Etchells.

In the course of the proceedings eight members, the same number of associate-members, four associates and one student were elected.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

St. Andrews Cleansing Department.—In a report on the cleansing department the burgh surveyor of St. Andrews, Mr. Watson, stated that the cost for the cleansing in 1912 was £382; in 1913, £329; and in 1914, £609, equal to an average of £457. The expenses in the last year had been largely due to sickness, two with three of the horses, one of which died, and two were off work for a total period of 283 working days. As a result of this, extra horses were temporarily hired. Taking the years 1912 and 1913 the average annual expenditure in the cleansing department under the present system was £381. Were the council to revert to the former system, the annual expenditure in the cleansing department might be anything from £366 to £440. If therefore there was not to be a recurrence of the misfortunes of 1914, the present system was the better from the financial point of view. There was also a great advantage in having the whole work of the cleansing department under the direct control of the town. There would therefore appear to be no reason for reverting to the old system.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

ARTERIAL ROADS IN GREATER LONDON.

REPORT OF SECTIONAL CONFERENCES.

A report of the [illegible] on the subject of arterial roads in Greater London has been issued by the Local Government Board. In addition to the minutes of the [illegible] conferences held, [illegible] the report contains a précis of replies to questions put to the Royal Institute of British Architects and the London Society, [illegible] to the latter, and a note as to the future work of the conferences.

The two bodies referred to are in agreement that [illegible] and future traffic, the observations of the London Society being as follows:—

Roads within the County of London should be considered as a separate problem to that presented by the roads in outer districts. Traffic necessities ought not to dominate the approaches to a capital city. Liberal space should be provided at all intersections to meet traffic requirements. A great deal of widening and alteration of existing roads might be avoided by systematic examination of good relief roads.

The proposals of London Traffic Branch of the Board of Trade are generally approved, subject to alterations in the line and direction which are submitted as alternative suggestions. The proposals are generally based on reliable data and are well considered.

Town planning schemes likely to facilitate the [illegible] and earmarking of open spaces in their proper relationship to arterial roads. Low-lying land and railways should be specially considered in this connection. Retention of [illegible] desirable. Building lines should be well set back to allow free planting.

Desirable that town planning schemes should be prepared. Preparation should be made in such schemes for all expected extensions of railway systems.

Width of arterial roads should be settled on definite principles. Main traffic roads should be 80 ft. wide, secondary roads 40 ft. wide, and residential roads 25 ft. wide, with 40 ft. width of air space.

While agreeing as to the general observations of the London Society, the Royal Institute of British Architects suggests that where land is not too costly space should be secured for grouped masses of trees and subsidiary planting or for continuous avenues. In regard to the widths of proposed roads they consider that the latter should be proportioned to the volume of traffic that will probably utilise them, and that increased width of road should be secured by offering reductions in the width of minor roads provided adequate distance is secured between the house frontages.

The Roads Improvement Association also takes the view that the existing roads are inadequate for existing and future traffic.

The Commercial Motor Users' Association submitted a memorandum indicating certain matters that will require consideration in connection with the designing of roads for purposes of passenger transport. The Surveyors' Institution offered no comments on the list of questions. The Commons Preservation Society, the District Surveyors' Association, the Institution of Municipal and County Engineers, the Co-partnership Tenants, Limited, and the Garden City and Town Planning Association have not yet been able to decide upon their replies, but may be regarded as having the matter under consideration.

In his observations on the reports of the London Society and the Royal Institute of British Architects, Colonel Hellard agrees generally with the introductory remarks of both. Though he also agrees as to the desirability of various road widenings recommended in different sections, he states that he would urge the imperative necessity for dealing first with work on the outskirts.

FUTURE WORK OF THE CONFERENCES.

As to the future work of the conferences the report says:—

"Having regard to the situation created by the war, the sub-committees have considered the desirability of postponing the arrangements for visiting the sites and altering the dates provisionally fixed in November for the meetings of the conferences.

"One reason suggested for postponement was that it might not be possible for all, or a majority, of members of the sub-committees to give sufficient time and attention to the matter under the present circum-

stances. It might also be the case that, in view of the national emergency, only perfunctory consideration could be given to the various questions and proposals, especially if there was little likelihood of there being any practical result of the labours of the conference until after the end of the war.

"As against this it was suggested that there was a good deal to be said for the view that ordinary duties should be carried on as far as possible at such a time, and that, if the work of the conferences and sub-committees was entirely suspended, it might be difficult to reawaken interest in it when the time became more opportune for its revival. Moreover, it had to be considered that there was likely to be a large amount of distress due to falling off in the employment of unskilled labour; that this distress might be much more acute nine months or a year hence than it is likely to be this winter, and that if it should be of such character that the employment of large bodies of men on relief works became a necessity in Greater London, the making or improving of roads might be regarded as the best means of providing such employment.

"The sub-committees felt, therefore, that if this necessity should arise the conferences should be in a position to make definite recommendations regarding some of the most important roads at least, so as to be ready with a scheme. It is necessary in the first place to proceed with the settlement of the lines of the roads; secondly, with the preparation of any plans which are necessary to make the scheme clear and intelligible; and thirdly, to prepare estimates of the probable cost, so that when the time is ripe an application can be made to have one or other of the proposed roads constructed as a means of relieving distress.

"With regard to the conferences to be held in November the sub-committees have decided that it is desirable to postpone these until the sub-committees are in a position to present their reports.

"A large number of the replies sent in by local authorities and associations have been received. The full consideration of these replies, of the many alternative proposals for making new roads and widening and improving existing roads, and the inspection of the areas affected by these proposals are matters which require most careful investigation.

"The decision of the sub-committees, therefore, is to proceed with the work forthwith, but to do it deliberately and exhaustively, with a view to making any recommendations as definite as possible."

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. Horace Boot, M.I.E.E., M.I.MECH.E., Tunbridge Wells and Westminster.

President-Elect Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

ANNUAL MEETING IN LONDON.

The sixth annual general meeting will be held in London, to-morrow (Saturday).

Programme.

11.45 a.m.—Meet in the Council Chamber, No. 4 Southampton-row, London, W.C.

12 noon.—Annual general meeting.
Minutes of last meeting.
Presentation of annual report of council.
Announcement of result of ballot for election of council for the year 1914-15.
Any other business.

1 p.m.—Adjourn for lunch.

2.30 p.m.—Re-assemble in Council Chamber.

2.45 p.m.—Presidential address.
Discussion on the following papers to be presented to the meeting:—
"A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts," by G. Belson Chilvers, M.R.SAN.I. (member).
"Housing of the Working Classes," by Edward Whitwell (member).
"The Future Control and Maintenance of Rural Roads," by J. S. Wooddisse (member).

B. Wyand,
Secretary.

39 Victoria-street, S.W.

INSTITUTION OF WATER ENGINEERS.

WINTER GENERAL MEETING.

The nineteenth winter general meeting (being the fourth statutory annual general meeting of the institution) will be held at the apartments of the Geological Society, Burlington House, W. (kindly lent for the purpose by the president and council of that body), on Friday and (if necessary) Saturday, December 11th and 12th. Proceedings will commence at 2 p.m. on Friday and 11 a.m. on Saturday.

The following papers will be read and discussed:—

(1) "Notes on Scraping a 15-in. Trunk Main at Batley," by J. C. Barrowclough, waterworks engineer.

(2) "The Whitton Pumping Station of the Ipswich Corporation Waterworks," by C. W. S. Oldham, corporation water engineer.

Advance copies of these papers will be sent to those wishing to take part in the discussions. Early application should be made by those intending to be present at the meeting, to whom alone they can be sent.

Programme.

(1) The minutes of the nineteenth ordinary summer meeting, held at Stockport, will be read and submitted for confirmation.

(2) The statement of accounts for the year 1913 (see "Transactions," Vol. xviii., pp. 282-283) will be submitted for formal adoption by the members.

(3) The ballot will be taken for the election of the council for the year 1915-16.

(4) The president, on behalf of the council, will move: "That Messrs. Wood, Drew & Co. be and are hereby appointed auditors to the institution for the year at a fee of five guineas, and that Messrs. Herbert Lapworth, D.SC., and Arthur Valon be and are hereby elected honorary auditors to the institution for the same period."

(5) The president will move: "That the members present at this meeting do confirm the decision of the council to subscribe from the accumulated fund of the institution a sum of fifty guineas to the Prince of Wales' War Relief Fund and a sum of twenty guineas to the funds of the Red Cross Society."

(6) Reading of papers and discussions thereon.

Percy Griffith,
Secretary.

20 Victoria-street, S.W.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President Dr. Maclean Wilson, D.SC.

ANNUAL GENERAL MEETING.

The annual general meeting of this association will be held at the Holborn Restaurant on Thursday, December 10th, at 3.30 p.m.

The chair will be occupied by Dr. Samuel Rideal, D.SC., F.I.C., F.C.S.

Business.

Read minutes of last meeting.
Chairman's report.
N.A.L.G.O. delegates' report.
Balance-sheet.

Resolution of council:—
"That the council recommend the association, at the annual meeting, to pay a contribution of £25 from the funds of the association to the Prince of Wales' National Relief Fund."

Presentation of an illuminated address to Mr. Chas. H. Ball, M.R.SAN.I.

Paper to be read by Mr E. Ardern, M.SC., Manchester, "A Recent Development of the Sewage Problem."

The council at their meeting on October 21st decided that, in view of the state of national affairs, the annual dinner should not be held this year.

J. B. Croll,
Hon. Secretary.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ASSISTANT COUNTY SURVEYORS.—[illegible] £100—£200.—Mr. Christopher L. Cowlard, clerk, County Council Offices, Bodmin.

ARCHITECTURAL ASSISTANT. [illegible] —Morley Corporation. £3 per week.—Mr. F. Turner, borough engineer and surveyor.

SURVEYOR.—December 5th.—Pontypool Rural District Council. £100 per annum.—Mr. T. Watkins, clerk, Club Chambers, Pontypool.

TEMPORARY ASSISTANT AND DRAUGHTSMAN.—December 10th.—Shoreditch Borough Council. £2 10s. per week.—Mr. T. L. Hustler, borough engineer, Town Hall, Old-street, E.C.

INSPECTOR OF NUISANCES.—December 11th.—Wirral Rural District Council. £125 per annum.—Mr. J. E. S. Olive, clerk, 54 Hamilton-street, Birkenhead.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

DRAUGHTSMAN CLERK.—Survey Department of the East Africa Protectorate. £160—£205, and house allowance £40.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SOUTHEND.—December 4th.—Schemes for a tuberculosis hospital, for the corporation. Premiums £100, £50, and £25.—Mr. E. J. Elford, borough engineer.

BEDS.—December 7th.—Designs for a secondary school for girls, for the Bedfordshire County Council.—Mr. W. W. Marks, clerk, County Council, Shire Hall, Bedford.

DUMFRIES.—December 31st.—Competitive plans for workmen's dwellings, for the Dumfries Corporation.—Town Clerk.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

NORTHWICH.—November 30th.—For the erection of six houses, for the rural district council.—Mr. E. T. Ward, Brockhurst-street, Northwich.

AYLESBURY.—November 30th.—For the erection of a ward and bath-room at the isolation hospital, for the urban district council.—Mr. W. H. Taylor, engineer and surveyor, Town Hall.

GLAMORGAN.—November 30th.—For building a boundary wall, school extension, and other works, for the county council.—The Architect, Metropolitan Bank Buildings, Neath.

GOWER.—November 30th.—For the construction of a sea wall 380 yds. in length, for the rural district council.—Mr. G. A. James, surveyor, Fairfield, Three Crosses, Dunvant, Glamorgan.

HOLMFIRTH.—November 30th.—For the construction of a reservoir and laying cast-iron mains, for the urban district council.—Messrs. J. Barrowclough & Sons, engineers, Cross-roads, Holmfirth.

DURHAM. [illegible] pavilion at the sanatorium, for the county council.—County Surveyor, Shire Hall, Durham.

GOSFORTH.—December 1st.—For the erection of [illegible] urban district council.—Mr. G. Nelson, surveyor.

MANCHESTER.—December 2nd.—For the erection of a school, for the Education Committee.—Accountant, Education Offices, Deansgate.

ABERTILLERY.—December 2nd.—For work of school extension, for the Education Committee.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

MANCHESTER.—December 2nd.—For the construction of a retaining wall, for the gas department.—Mr. F. A. Price, superintendent, Town Hall.

IPSWICH.—December 3rd.—For the erection of a boiler-house, for the corporation.—Mr. J. R. Mead, borough engineer and surveyor.

BRIGHTON.—December 3rd.—For the erection of a hostel, for the Education Committee.—Messrs. T. Simpson & Son, surveyors, 16 Ship-street, Brighton.

ROCHDALE.—December 4th.—For the erection of a school, for the Education Committee.—Mr. P. W. Hathaway, Town Hall.

NORTH RIDING.—December 4th.—For the erection of a combined cookery and handicraft room, for the Education Committee.—County Education Offices, Northallerton.

SHORTLANDS.—December 4th.—For the construction of a pumping station and contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

FARNHAM.—December 5th.—For the erection of a porter's lodge and discharging wards, for the Committee of the Farnham Joint Isolation Hospital.—112 West-street.

BILLINGE.—December 7th.—For constructing a borehole for water supply purposes, for the urban district council.—Mr. A. Darlington, clerk, Council Offices.

HANTS.—December 7th.—For the erection of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

SHEFFIELD.—December 7th.—For the erection of a school medical department, and alterations to a school building, for the Education Committee.—City Architect, Town Hall.

ARKLOW.—December 7th.—For the erection of 100 houses, for the urban district council.—Mr. L. O'Toole, Main-street, Arklow.

STAFFS.—December 8th.—For the erection of a council school, for the county council.—Mr. Graham Balfour, director of education, County Education Offices, Stafford.

BARNES.—December 8th.—For building a dispensary and tuberculosis wards at the hospital, South Worple Way, for the urban district council.—Mr. G. Bruce Tomes, surveyor.

ST. THOMAS.—December 10th.—For the construction of waterworks, for the rural district council.—Mr. S. R. Lowcock, 6 Queen Anne's-gate, Westminster, S.W.

PEMBROKE.—December 10th.—For the erection of a school, for the Education Authority.—Mr. O. T. Thomas, architect, County Education Offices, Haverfordwest.

NORTHWICH.—December 10th.—For the erection of a school, for the Administrative Sub-committee of the Northwich District.—Mr. A. E. Powles, architect, 7 Winnington-street, Northwich.

SOUTHEND.—December 14th.—For the erection of an electricity sub-station and incidental works, for the corporation.—Mr. E. J. Elford, Municipal Buildings.

WEST RIDING.—December 18th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

SPALDING.—December 19th.—For building six cottages, for the rural district council.—Messrs. Davis & Cowley, architects, 6 Double-street, Spalding, or 2 York-row, Wisbech.

EAST STOW.—December 30th.—For the erection of working-class dwellings, for the rural district council.—Mr. H. E. Wilkes, clerk, Council Offices.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI DECEMBER 4, 1914. No. 1,194.

Minutes of Proceedings.

Private Street Works: Premises Extra Commercium

The evolution of the principle by virtue of which the owners of premises *extra commercium* are exempted from liability for private street works expenses affords an interesting illustration of law in the making. There are, of course, the well-known statutory exemptions relating to churches, chapels, churchyards and burial grounds, railways and canals. But the general exemption of *extra commercium* premises is a corollary which the Courts have deduced from the statutory definition of an "owner." It will be remembered that sec. 4 of the Public Health Act, 1875, defines an "owner" as "the person for the time being receiving the rack rent of the lands or premises . . . or who would so receive the same if such lands or premises were let at a rack rent." In 1883 the effect of the definition was considered with reference to the parapets of a bridge carrying a road over a deep cutting of the Great Eastern Railway, and having their foundations in the railway company's land. In the ordinary sense of the word the company were undoubtedly the owners of the parapets, and if they were ever let at a rack rent it would be the company who would receive it. But inasmuch as the bridge and parapets had been built in fulfilment of a statutory obligation and for public purposes, the parapets never could be let. To quote from the judgment: "The bridge is by the statute dedicated to public use, and its fence walls are provided for public protection; and if the ownership and control of the walls is in the company it is so for public purposes, and subject to the obligation of perpetual maintenance, unless and until some other good and sufficient fences shall be provided by the company in their stead for the public protection. The company could not let the walls at a rack rent, and if they might use them for any purpose it must be a use subordinate to the public purposes to which the bridge as a structure is in its whole devoted." In these circumstances the House of Lords held that the railway company were not "owners" within the statutory definition, and were therefore not chargeable with private street works expenses (*Great Eastern Railway Company* v. *Hackney District Board*, 8 A.C., 687). It will be seen that in this interpretation rather a large assumption is made—viz., that the definition is restricted to premises which are capable of being let at a rack rent. Taking the words of the Act in a strictly literal sense, it is arguable that that assumption is unwarranted. At the same time it is probable that the decision accords with the real intention of the Legislature, or what would have been their intention had such a case been present to their minds in framing the definition.

In applying the principle established by this case, however—viz., that there cannot be a statutory "owner" of premises incapable of being let at a rack rent—the alleged incapacity of particular lands or premises has been in several cases very narrowly scrutinised, with the result that the "first fine careless rapture" of the Great Eastern Railway Company has not always been recaptured. The definition of "owner" in the Metropolis Management Act, 1855, is similar to that in the Public Health Act. But when the Vestry of St. Mary, Islington, contended that they were not the statutory "owners" of a London square which they had bought and covenanted to use solely as a public garden, the Court "distinguished" their case from that of the railway company, and decided against them (*Vestry of St. Mary, Islington*, v. *Cobbett*; 1895, 1 Q.B., 369). And when the Herne Bay Urban District Council raised a similar contention with respect to a recreation ground which they had covenanted to keep open for the use of the public for ever, they met with the same fate (*Herne Bay Urban District Council* v. *Payne*; 1907, 2 K.B., 130). So also it befell the owner of a strip of land 263 ft. long, but only 4 in. wide, the site of a fence which he was under covenant to maintain for ever (*Williams* v. *Wandsworth District Board of Works*, 13 Q.B., 211). The reason for this distinction is that in these three cases the incapacity of the premises to yield a rack rent was imposed, not by Act of Parliament, but only by covenant. Now a covenant may be released by agreement between the respective parties thereto, or their representatives, and in the event of this being done the land might be let. Therefore the incapacity to yield a rack rent is not absolute and irrevocable, because it can be removed by the mere act of the parties. On the other hand, an incapacity imposed by statute can be determined by nothing short of another statute. Probably, as a matter of fact, the chance of the release of the covenant is about as remote as that of the repeal of the Act, but the Courts have seen fit to take the possibility into account in the one case and to ignore it in the other. This would seem to be an exception to the rule "*De minimis lex non curat.*"

* * *

Institution of Municipal Engineers.

Although it was not found possible, owing to the prevailing circumstances, to hold the annual meeting of the Institution of Municipal Engineers this year in the new president's "town of origin," those members who assembled for the business meeting in London on Saturday last were privileged to hear an excellent address of a very practical character from Mr. W. H. Matthews Jones, the city engineer and surveyor of Chester, who has just assumed office. Mr. Matthews Jones dealt with a variety of topics, and as he refrained from overloading his address with unnecessary detail, he was able to cover a very wide field. Of the matters which come

[illegible] the municipal engineer in the course of his ordinary duty, [illegible] to probably of greater importance than drainage. Mr. Jones pointed out that the surveyor who deals fairly with bad [illegible] is [illegible] a good turn to the building owner, which is unfortunately in many cases not appreciated, and he suggested that [illegible] by the contracts this work should be taken out and paid at the expense of the builder. This is no doubt sound advice in the cases to which it applies, but the trouble usually occurs in regard to speculative [illegible] in the absence of any subcontract, the building owner and builder are one and the same person. In such circumstances the attentions of the surveyor are naturally not very welcome, although they must be persisted in, even if the offender is—as is only too frequently the case—also a member of the council. We are convinced, however, that supervision will never be thoroughly satisfactory or really effective until the surveyor has the advantage of some measure of security of tenure.

Dealing with the making of new streets for modern road traffic, Mr. Jones referred to the heavy burdens which are now placed upon the shoulders of the ratepayer to meet the demands for road maintenance. In this respect Chester has a special grievance, inasmuch as its roads are constantly being damaged by an enormous volume of through traffic flowing from Liverpool, Manchester, and the North of England to Wales. Speaking from this experience, Mr. Jones expressed his firm opinion that granite setts properly laid on a solid foundation will surely come back as the most cleanly and lasting street or road surface paving that can be had, and that if such paving is tar-sprayed or tar-painted, and the joints well filled up, it becomes almost noiseless. Further, he made an interesting reference to some experiments which he has been carrying out in the construction of armoured concrete roads, which, he was able to state, had up to the present, given the greatest possible satisfaction. One other matter dealt with in the address may be referred to—namely, the removal of trade refuse. It appears that in Chester all trade refuse is removed free of charge, the object apparently being to avoid the controversy which may arise in certain cases, if a charge is made, as to whether particular items are "house" refuse or "trade" refuse. The question is one which causes considerable difficulty in some districts, inasmuch as the general power to remove refuse conferred by the Public Health Act, 1875, is limited to the removal of "house" refuse. Power to remove "trade" refuse, however, coupled with a right to make a reasonable charge for so doing, may be acquired by the adoption of sec. 48 of the Public Health Acts Amendment Act, 1907.

* * *

Salaries in Small Districts.

The question of the underpayment of surveyors in small districts is one upon which we have frequently expressed our views, and we observe with satisfaction that it formed the subject of a paper at the annual meeting of the Institution of Municipal Engineers last Saturday. Many good points were made both in the paper—which was read by Mr. G. Belson Chilvers, surveyor to the Oundle Urban District Council—and in the course of the subsequent discussion. Mr. Chilvers made a plea for a minimum annual salary of £120—surely not an extravagant demand for whole-time professional services. Starting with this minimum, he advocated the adoption of a sliding scale based upon population, area, rateable value, and the duties to be performed, and suggested that provisions to this effect should be inserted in any Bill which is promoted for obtaining superannuation and security of tenure. It must be borne in mind, however, that the President of the Local Government Board has already indicated that if these advantages are to be obtained, they must be coupled with a proper standard of professional qualification. Two subsidiary questions were mentioned—namely, the combination of a low salary with the right to undertake private work, and with the right to take pupils. The first is open to the objection that an officer may find that he has to act at once on behalf of a building owner and the council, and although he would probably exercise the greatest care in such a case not to take any advantage of his dual capacity, the position is essentially a false one, which no professional man ought to occupy. As regards pupils, if they are taken as a means of increasing an inadequate salary, the evil is merely being perpetuated by the creation of an abnormal supply of potential applicants for future appointments. The solution of the problem is not easy, but the cardinal points are that a reasonable minimum wage should be paid without resort to artificial means of increasing the ordinary salary, and that nothing should be done to lower the standard of qualification.

* * *

Liverpool's Novel Street Lighting Scheme.

A new departure in street lighting is contemplated by the Liverpool Corporation, and the experiment will be watched with interest by those concerned with local administration all over the country. According to the *Liverpool Post* it is intended to inaugurate at an early date a scheme of acetylene gas lighting for the suburbs of the city. In connection with the project we are reminded that the Liverpool Corporation have been engaged upon the construction of sections of a great highway destined eventually to encompass the city on all sides save that bounded by the Mersey, and to be called Queen's-drive. When completed, this road will be some 15 miles in length, while the widths will vary from 80 ft. to 120 ft. or more. Naturally the question of the safety of the pedestrian in crossing such roads has engaged the serious attention of the corporation, and it has been decided to introduce the acetylene lighting scheme at various points in Queen's-drive where thoroughfares converge, and other places where the volume of traffic would seem to call for extra precaution. Standard-posts, 4 ft. or 5 ft. high, and coloured red, are to be provided, and will bear small lamps, which at night will display through four lenses turned to the various quarters of the compass "a brilliant but concentrated light." The standards will contrive to serve a double purpose. First, they will act as "caution" indicators to the drivers of vehicles; secondly, by being placed upon small "islands" of raised pavement, they will direct the attention of pedestrians to the existence and locality of the refuges, and thus help them to cross the thoroughfare in security. We are told that the low elevation of the standards was determined by the consideration that they will thereby be rendered distinctive from the ordinary signposts and illuminants. It is, in fact, purely a protective scheme, supplementary to the existing lights, and in this respect it possesses the merit of originality and novelty. Its success or non-success are, of course, issues which only the future can decide.

* * *

Wiltshire Main Roads.

For some time past the Wiltshire County Council have had under consideration the question of the desirability of themselves undertaking the maintenance and supervision of the main roads at present repaired under contract by the rural district councils. Writing on the matter about

three months ago, we ventured to take exception to a speech made in the council by one of the members, who, instead of debating the matter as one of policy, made the discussion the opportunity for an attack upon the thirteen district surveyors *en bloc*. His allegation was that the county surveyor had been complaining for a long time past that the supervision of the roads was entirely inadequate, and that there was no one to see that the men were earning the wages which they were paid. We observe that at the last meeting of the council there was presented by the Roads and Bridges Committee a report, in which it was recommended that no change should be made in the present system, but that the attention of the district surveyors should be called to the need for further supervision. In the face of this report, however, the same member returned to the charge, and on this occasion was guilty of an inaccuracy of some consequence in stating that "forty-three county councils out of forty-eight in the Kingdom had adopted the plan suggested" by the county surveyor. The plan in question provides for supervision by twenty road foremen in charge of small districts under the direct supervision of the county surveyor. We are not discussing the merits of such a proposal, but we say without hesitation that it is not one which has been adopted by forty-three county councils, being essentially different from supervision by district surveyors on the staff of the county surveyor. If there has been any slackness of supervision in certain districts in the past, it is to be hoped that the defaulters will take the hint offered in the report of the Roads and Bridges Committee.

* * *

New Book on Town Planning. "We ought to study many towns before we attempt to lay out a new one; we ought to study our own town very carefully before we plan its extensions." These words from the preface afford a key to the aim of Mr. Julian Julian, B.E., borough surveyor of Cambridge, the author of an excellent little book which has just been published.* The work in question is not so much a guide to the Act of Parliament as an attempt to deal with the principles of town planning, to indicate some of the subjects to be investigated, and to suggest some of the problems to be solved. The first two chapters are historical, and deal respectively with ancient town planning and mediæval and modern town planning. Next comes a chapter on authorities and by-laws, which concludes with an argument for conferring on local authorities a discretionary or dispensing power. A general account of the powers of local authorities follows, together with an important and suggestive chapter on practical considerations in the preparation of town plans. The final chapter contains an account of a town planning tour in Great Britain, France, Portugal, Switzerland, Germany, Holland, and Belgium, the places visited in the last-named country including Louvain and Liége. There are many books on town planning, but none which covers quite the same ground that this one traverses so ably. Mr. Julian's work will form a valuable addition to the town planner's library.

* * *

Wood Paving and Climate. The comparative immunity of wood pavements in Europe from many of the troubles which usually accompany the use of this material in America has led Mr. S. R. Church, an American engineer, to inquire into the reasons for this phenomenon. The absence of slipperiness is accounted for by the fact that in both Great Britain and France a softer wood than the long-leaf yellow pine of America is used. As regards "bleeding" the British climate is favourable, owing to the extreme rarity of very hot weather; while as regards Paris it is said that there is not enough oil in the blocks to render them liable to this evil. Excessive expansion and buckling, however, are the principal sources of difficulty, and in this respect our freedom from trouble is accounted for by the high average humidity of our climate. In America a period of extreme heat and drought may absorb practically all the moisture from a wood pavement, and be followed by torrential rains. These conditions cause a sudden expansion to take place, with the resulting evils. Moreover, it is said that, from the point of view of avoiding excessive expansion, the kind of wood used in this country is superior to that used in America. Mr. Church concludes with an interesting tribute to European workmanship, expressing the view that "pavements in Europe are laid and maintained by men who have more conscience, or at least take greater pride in their work than we find on the average job in our country."

* * *

Effect of Frost on Concrete. The paper which was read by Mr. John Hammersley-Heenan at the last meeting of the Institution of Civil Engineers was divided into two sections. In the first the author dealt with the precautions to be taken in the execution of concrete works in freezing weather, with special reference to Canadian practice. The conclusion arrived at was that concrete will not be damaged by frost if it has first had a chance to set for about two days under favourable conditions. To effect this it is necessary not only to devise some means of mixing the concrete with materials freed from frost, but also to place it in the forms before it has commenced to freeze, and to protect it and keep it warm for the period named. The latter part of the paper was concerned with the important question of the effect of frost upon concrete, the investigation of which is rendered doubly troublesome by the difficulty of deciding in individual cases whether corrosion is due to frost or faulty workmanship. From the information available, however, Mr. Hammersley-Heenan is of opinion that concrete exposed in air in a dry locality need not be affected by frost any more than good building stone, and probably it will stand much better; concrete always submerged under water is protected, and need cause no anxiety, but concrete alternately melted and frozen must be protected. An abstract of the paper will be found in another column.

* * *

Works Projected for 1915. On January 29th next will be published the customary Special Annual Issue of The Surveyor, a prominent feature of which will be a comprehensive list of the works projected by local authorities for 1915. Those of our readers who propose to respond to the request we have made to them for particulars of such proposals will greatly oblige by forwarding their returns without delay. The form which these should take is now generally understood, but the exact nature of the information sought can be seen by reference to our issue of January 30th last, some thirty-six pages of which were devoted to the publication of these official forecasts. Any other material which readers may consider sufficiently interesting for inclusion in the issue will be welcomed, and this matter also, particularly if its use involves the reproduction of photographs or drawings, should likewise reach us at the earliest possible moment.

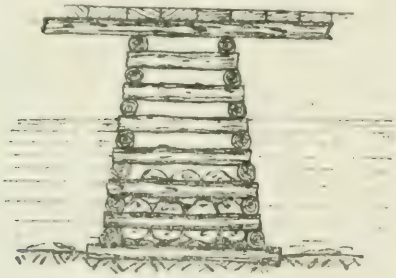
* "An Introduction to Town Planning." Price 5s. nett. London: Charles Griffin & Co., Limited.

Temporary Bridges.

By G. BERTRAM HARTFREE, F.S.I., Engineer and Surveyor to the Alton, Hants, Urban District Council.

[illegible] the author has been consulted by the Military in [illegible] and his proposals for dealing with extraordinary loads.

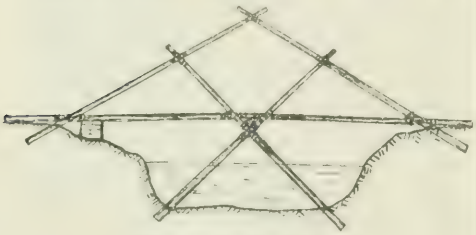
[illegible] cordage the special class of builders' labourers known as scaffolders are necessary. For the timber-work it is very probable that wheelwrights and the



Crib-work.

[illegible] would be more suitable than joiners or house carpenters. [illegible] are timbers, ropes, dogs and spikes, and possibly the type and quantities of these will be an all-important factor in settling the design.

A minimum width of 9 ft. for roadway should be provided—in no case may it be less than 8 ft. This allows for infantry in fours, cavalry two abreast, and vehicles passing in one direction. Should a double [illegible] is probable, which sling and



Span Not Exceeding 18 ft.

similar bridges are constructed, that two bridges 9 ft. wide may be more effective than a single width of 18 ft. Guard rails or ropes are necessary, especially for horse traffic—a writer, describing the operations in the Chitral campaign, states that it was found necessary to fix bushes along the edges of bridges before driving cattle over.

With shallow watercourses the simplest substitutes for piers are stout posts driven [illegible] may be adopted.

Other substitutes include wagons and carts, or weighted cylindrical vessels securely fixed in the form of a pile of shot. With suitable materials at hand, piers consisting of cribwork may be utilised. This consists of squared or round timbers, the latter roughly squared at "passings," and the various members fixed by bolts and "dogs." When supplying the latter, in addition to the common form that has spikes at both ends and on the same plane, a certain number should be provided with spikes at each end; but while the one is vertical, the other is horizontal, technically known as "bitches." A batter of 2in. per foot in height is necessary; a tray is formed in bottom, as shown, so that the pier may be towed to position and weighted by large stones and sunk.

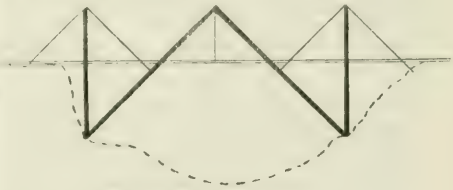
An X-shaped support can be constructed out of scaffold poles, as shown in sketch. This is suitable for spans not exceeding 18 ft.

For larger spans sling bridges may be adopted. The diagrams show members in compression, thick

Single Sling Bridge.

lines; tension, thin lines; cross strain, double lines. The single sling bridge is suitable for spans up to 45 ft. in four bays; for larger spans, up to 60 ft., stiffening would be required, and six bays are necessary. Over 60-ft. and under 80-ft. span may be bridged by a treble sling with stiffeners.

For all bridges planks or chesses 1½ in. or 2 in. thick should be provided and placed abutting edges crosswise; for wheeled traffic longitudinal planks are required in addition. Baulks or longitudinal supports for transverse planks are required, five in number per 9 ft. of road, these should be 7 in. by 3 in.



Single Sling Stiffened.

or 6½ in. in diameter. The average length of bays is 12 ft., and a camber $\frac{1}{30}$th span is necessary.

In calculating loads on piers, &c., a dead weight of 90 lb. per lineal foot of bridge may be allowed for the superstructure, and in addition a live load of 5 cwt. per lineal foot per 9 ft. in width for infantry in fours. The weight of cavalry two abreast is 3½ cwt., and a bridge carrying either of the foregoing is suffi-

Treble Sling Stiffened.

cient for field guns and ordinary wheeled carriages connected with a military force.

In calculating the strength in cwts. of rectangular beams for live loads, the formula $C\frac{bd^2}{L}$ may be adopted. C equalling—larch 1, fir 1·3, cedar 1·4, beech

1.6 cub. ft. per cubic yd. 2. Sack 2.4, this gives a factor of safety of about 3. A breadth of inches, depth 40 inches. 1. span in feet.

CONCRETING IN FREEZING WEATHER, AND THE EFFECT OF FROST UPON CONCRETE.*

By JOHN HAMMERSLEY HOLMAN, ASSOC.M.INST.C.E.

[illegible] who [illegible] upon to carry out work in concreting during the winter [illegible] that the methods of construction which were satisfactory in the summer will need considerable modification to suit winter conditions.

Concrete work, especially the lighter forms of reinforced concrete, used in building construction needs [illegible] and supervision. As a result of considerable experience gained during the last few years, it can be said that the freezing of concrete will not damage it if it has had a chance to set [illegible] for about two days. The effect of the freezing is simply to delay the process of hardening, which will again proceed under suitable conditions, and will eventually [illegible] through. If concrete is frozen before it has commenced to set, it will not be injured if precautions are taken to prevent it from freezing again after it thaws until it is sufficiently hardened to withstand the effects of subsequent freezings. It is alternate freezing and thawing during the process of setting that causes the damage.

To meet the foregoing conditions, when carrying out concrete work in winter, it is necessary to devise means of mixing the concrete with materials freed of frost, placing it in the forms before it has commenced to freeze, and then protecting it and keeping it warm for about two days. After that it may be allowed to freeze without fear of its being damaged.

In the case of concrete in masses of large bulk, it is unnecessary to apply artificial heat, as the large body of concrete will generate sufficient heat during the process of hardening to enable the mass to set; all that will be necessary is to protect the outside of the concrete so as to keep the heat in. This can best be done by covering the concrete with clean straw.

For light sections of concrete, such as in reinforced concrete, poured at a temperature not below 22 deg. Fahr., some engineers allow salt to be used in a proportion not exceeding 10 per cent. There are many arguments for and against its use. The author prefers not to use it, except in marine works when the concrete is mixed with sea-water and the salt is admitted in that form. He has found that, instead of using salt, good results will be obtained for temperatures that do not fall below 22 deg. Fahr. by heating the water with a steam-hose taken from the boiler, and when necessary placing a few coke or wood fires on the heaps of sand and crushed stone, the usual precautions being taken to protect the concrete when in the forms, as described later.

For lower temperatures than those referred to above greater precautions must be taken to heat the ingredients by means of steam coils or radiators.

The concrete having been mixed, and the portion of the work to be carried out decided upon, the floor immediately below it should be partitioned off with tarpaulins, and coke stoves arranged under the floor slab, allowing about one stove to every 800 sq. ft. of floor space. All loose dirt and snow must be removed from the forms with brooms, and a steam hose should be applied to remove all ice and frost, the steam playing continuously over the forms in advance of the concrete, thus warming them in readiness for the concrete. The concrete should be poured quickly and continuously, and as each section is completed a tarpaulin may be drawn over it, supported on wooden strips about 6 in. above the surface of the concrete. In most cases this protection will be sufficient, but during very cold weather it will sometimes be found necessary to form a sort of tent over the floor, in which extra stoves are placed to protect the workmen and the upper surfaces of the concrete.

Great care must be taken to have the fires kept burning continuously for two days, after which the concrete may be allowed to freeze without fear.

The work must be examined from time to time until it is found to be hardened sufficiently. During summer working the author has allowed the supports from the underside of slabs to be removed in four days, but on other occasions four weeks have not been found to be too long.

There are many examples of concrete works which have stood the test of time without showing any signs of being affected by frost; but, on the other hand, a few cases have been reported of very serious corrosion due to the action of frost, such as bridge piers and reinforced-concrete piles.

Judging from the information available at present, concrete exposed in air in a dry locality need not be affected by frost any more than good building stone, and probably it will stand much better. Concrete always submerged under water is protected and need cause no anxiety. But concrete alternately wetted and frozen must be protected from frost. On work which is being carried out at Halifax, Mr. John Kennedy, M.INST.C.E., is protecting the concrete piles between high and low water with a covering of wood about 2 in. in thickness, which it is hoped will prevent the action of frost.

* Abstract of paper read at a meeting of the Institution of Civil Engineers on Tuesday last.

STORIES OF GREAT ENGINEERS.

There is some consolation in the fact that, though the pay of the rank and file of civil engineers is still very vile, it is vastly better than it was in the days of yore—at least, in the cases of consultants of repute. It is recorded that John Smeaton was satisfied to be paid two guineas for a full day's work, and this was the man of whom Robert Stephenson spoke as "the engineer of the highest intellectual eminence that had yet appeared in England," and "the greatest philosopher in our profession that this country has yet produced."

Rennie—he was chief to the Manchester Waterworks Company for his year and a-half's advice was only £159, his charge to them for a whole day's labour being six guineas. The Ordnance Department he charged seven guineas a day, and General Browning, the head of the department, complained, saying it was equal to the pay of a Field Marshal. "Well," replied Rennie, "I am a Field Marshal in my profession, and if a Field Marshal in your line had answered your purpose I suppose you would not have sent for me!" "Then you refuse to make any abatement?" "Not a penny," replied the engineer—and the bill was paid.

Have we any leading engineers as versatile as John Rennie? During his college career he read Emerson, Switzer, Maclaurin, Belidor, and Gravesande, allowing neither pleasure nor society to divert him from his studies. As a relaxation he learnt French and German, and was shortly able to read both with ease. His recreation was mostly of a solitary kind, and having a taste for music he acquired considerable proficiency on the flute and the violin, and even went so far as to buy a set of bagpipes and learn to play upon them. But when he left Edinburgh the extensive nature of his engagements so completely occupied his time that in a few years flute, fiddle and bagpipes were laid by altogether.

Among John Rennie's earliest pieces of workmanship was a fleet of miniature ships, which he made when he was only about ten years old. Shortly after, by the advice and with the assistance of his friend Meikle—who took as much pride in his performances as if they had been his own—Rennie made a model of a windmill, another of a fire engine (or steam engine), and another of Vellore's pile engine, all displaying a considerable amount of manual dexterity. According to Dr. Smiles' "Lives of the Engineers," at least some of these early efforts of the great engineer's boyish genius were still in existence some ten years ago. It would be interesting to know if they still exist, and, if so, where.

Liverpool Municipal Staffs' War Fund.—All the officers, servants, and workmen in the Liverpool municipal service consented to subscribe, *pro rata*, to the war relief funds, and the deductions are being made from their salaries and wages on each monthly or weekly day of payment. So far as can yet be estimated, the sums from the various departments will amount to about £20,000 a year.

A Plea for the Better Remuneration of Municipal Surveyors and Inspectors of Nuisances in Small Urban and Rural Districts.*

By G. HELSON CHARLES [illegible], Surveyor to the Ormskirk Urban District Council.

[illegible] the small urban districts, and to the majority of the rural districts, one cannot but feel that the remuneration often offered to these officers is exceedingly small and, I think we can justly say, scandalous, especially when an officer has to devote his whole time to his duties. Municipal officers are well acquainted with the position of affairs. The salaries vary from £60 to £90 per annum, and in some cases the amount offered is even lower than this. The duties to be performed, as laid down in the advertisements or in the list of duties provided for the candidate's guidance, leave no doubt that a "fully" qualified man is required.

In the smaller places the officer has invariably to carry out the duties attached to the dual appointment of surveyor and inspector of nuisances, and it is laid down that he must hold the Inspector of Nuisances' Certificate of the Royal Sanitary Institute, or some similar qualification, this being imperative, according to the Local Government Board requirements relating to the appointment of inspectors, if a council desires repayment of half of this officer's salary. I ask, do the councils realise what it usually costs a man to obtain even this qualification? As a preliminary training the officer may have spent several years in a surveyor's or inspector's office; in many cases he has obtained the aid of a professional coach to assist him to acquire the necessary knowledge, and has devoted a large amount of his otherwise leisure hours to study. He has had to scrape together the necessary fee for the examination, and in addition he has often had hotel and travelling expenses to pay, and he has had to provide himself with a large number of professional books which cost anything from a few shillings each upwards, and together entail a large outlay. Even supposing the student for the qualification dispenses with any help, he has to make up for it in time and in money for more books, and the money has to be gleaned from a small wage. When the individual has obtained his certificate, the hope held out to him is a paltry remuneration working out at from 23s. to 34s. weekly—a less sum than is paid to many unskilled labourers.

Is it fair and just to pay municipal officers a less sum than is paid to a mechanic, considering the knowledge required from and the responsibility laid upon him? He is supposed to be and should be qualified to supervise the work of these men, and to have a sound knowledge of all work connected with building and sanitary engineering in order to interpret aright anything required to be done. As an inspector, it is necessary for him to be at least a fair draughtsman, while his general knowledge must certainly be of a high standard.

As a surveyor his duties may be multitudinous. In addition to being highway, building and sanitary surveyor, he may be sewage works manager, waterworks engineer, gasworks manager, superintendent of bathing-place, recreation grounds, cemetery and allotments, and, it may be, chief officer of the fire brigade. He has full responsibility thrown upon him for all the work to be performed. He is called upon to prepare plans, specifications and estimates for all work carried out, which may be very considerable. Should the council undertake the erection of working-class dwellings, he has to prepare the plans without any extra remuneration, and he may also have to prepare plans for other municipal buildings.

The amount expended yearly may vary upwards from £2,000 (which figure is low enough for comparison) upon actual work carried out, including labour and materials in all departments. Taking an architect and surveyor's fee for preparing necessary plans, specifications and supervision of works at 5 per cent, this would amount to £100 exclusive of all incidental extra expenses. Many of these same councils will pay an outside gentleman this 5 per cent, and in addition incidental and travelling expenses without a murmur, and yet they expect their permanent officer to work for less than 3 per cent on work carried out. The officer is at the same time called upon to attend council and committee meetings at hours when other people are taking a little recreation. This time, in some places, is no small amount, and the officer can scarcely call his body or his soul his own. He has often to put up with the whims and fancies of individual councillors, making his life none too pleasant. At the hours when the ordinary mechanic is taking his leisure, he is thinking and pondering over his work for the next day. It is not for him to say "Take no thought for the morrow." The mechanic downs his tools and the clerk his pen at the usual hour of leaving off, and thinks no more of his work until starting-time comes next day.

It is very certain that the surveyor has to spend a good deal more time and money on his education in order that he may become properly qualified than the inspector of nuisances. He requires a much wider knowledge (which is, in my opinion, much harder to acquire), and the money spent on his education and the expense incurred to secure the necessary diplomas and certificates showing his efficiency amount to a considerable sum.

We need only to glance through the table set out by Mr. H. P. Boulnois, and to read Prof. Matthews' lectures at the University of London, to realise the vastness of the requirements. As surveyor to one of the smaller urban authorities I can speak feelingly, and I feel sure you will forgive me if you think I am stating my own case, but I have had forced upon me the fact that a great deal more is expected from us than is often expected from surveyors to the larger authorities, where specialisation is the rule, and where it is very seldom that they are expected or required to carry out all municipal works. It would, of course, be absurd for this reason to ask that our remuneration should be as much as theirs, but it is very certain a substantial increase should be given—more in keeping with our position and status, and the knowledge we have to possess.

During the last few years, as you are all probably aware, Nonconformists in this country have come to the conclusion that it is necessary that their ministers should have a minimum salary or stipend of £120 per annum (a low enough figure) if they are to keep themselves comfortable and maintain a position befitting their station in life, and the members of the various communities are evidently in agreement with this if we may go by the large sums of money collected to secure this object. Adopting these same reasons, and in all sincerity, I feel that our position is at least equal with theirs, and our duties quite as onerous. We are told cleanliness is next to godliness, and our duties are bound up with cleanliness; and can we not say godliness goes with cleanliness? I contend therefore that a minimum salary of £120 per annum should be paid to surveyors and inspectors throughout the country if whole-time service is required. No district is so small that this amount could not be paid, and it is certainly not over large for an officer to keep up a respectable appearance and live comfortably, and at the same time add to his professional knowledge, which latter is very necessary and cannot be done without money—that is, if he desires to be up to date and advise his council wisely.

In what way can this more efficient remuneration be secured? It cannot, I fear, be obtained by trade union methods for obvious reasons, and, as stated in my article in our *Journal*, the only way is to bring pressure to bear upon the Government, or the Local Government Board, to force local authorities to pay a minimum salary worked out on a sliding scale, taking population, area, rateable value, and the duties to be performed into account, and adopting £120 as the minimum. At the same time it must be made

* Paper read on Saturday last at the annual meeting of the Institution of Municipal Engineers.

compulsory for the authorities to appoint a fully qualified man to carry out not only the duties of an inspector of nuisances, but also of surveyor and all that term means. Why should not a minimum salary be incorporated in any Bill which is promoted for the superannuation and security of tenure?

Many small towns get over the question of the small salary, and evade their responsibilities by allowing their officer to undertake private work. I question whether this is a wise course to adopt in any case, since it is evident such an officer cannot always do justice to the council he serves when private interests conflict, as at times they will do. He often becomes supervisor and adviser to his council as to his own private work, and it goes without saying that no man should be in this position. The architect and surveyor in private practice is, I feel, justified in complaining of this procedure, although actually his complaints may not always be justified, as I feel certain that all public officers who carry out private work in their districts are very conscientious, and to prevent any cause for complaint would themselves go beyond their council's requirements.

It appears to me that much could be done by the combination of districts. The surveyor to the small urban could also act as surveyor to the adjoining rural district, or to part of it, and the inspector of nuisances could follow suit with more satisfactory results. At the same time, in making this suggestion I feel that no district is so small or so poor that it could not pay the minimum salary before mentioned, and secure a full-time officer to itself.

DISCUSSION OF MR. CHILVERS' PAPER.

Mr. E. A. Stickland (Windsor), in proposing a vote of thanks to the author, said it seemed to him that local authorities at the present time wanted a great deal more for their money than they ought reasonably to expect. At the Cheltenham meeting of the Institution of Municipal and County Engineers Mr. Percy Boulnois took up the question of the training of municipal engineers, and from what he said it seemed that a necessary preliminary to being able to earn 30s. a week was that a youth must take a course at a university and be apprenticed to a good engineer. If the youth had a good master, and the latter were able afterwards to get his pupil a situation at the wage he had mentioned, the gentleman in question would think he had done well for the young man. Later on, perhaps, the budding municipal engineer would look round for a better appointment—as surveyor and inspector of nuisances at a salary of, perhaps, £120 a year. It was a disgrace. A bricklayer could earn his 10d. an hour, but a surveyor to a local authority, who worked often fifteen hours a day, was not as well paid, and yet must not live in the same way as the bricklayer. For £2 10s. a week he had to keep up a position which it was only possible to do on at least £5 a week, the result being that, unless he had other sources of income, he made a very poor show. And all the time they had someone looking after them to see that they remained honest. The question was, how were they to improve their position? So long as local authorities offered salaries of £120 and £150, and got as many as eighty applicants for the vacant posts, they could hope for nothing. The mere fact that there were so many applicants for such positions would be an encouragement to public bodies to offer these small salaries, and the only remedy seemed to be the formation of an association to fix adequate rates of remuneration.

Mr. H. C. Adams (London), seconding the vote of thanks, said he had been through the mill of municipal appointments, and therefore, while it had been his good fortune to get into private life, he had certainly inside knowledge of the circumstances. In his paper Mr. Chilvers did not make it quite clear whether he referred to all municipal engineers or only to some who were underpaid. He thought, perhaps, that the essence of the whole matter was given in the concluding part of the paper, in which the author called for a minimum wage for all municipal engineers. That question had agitated the country for many years without any solution being obtained. They had to consider the value of a job, and it was impossible to generalise in every case in that connection. In a district with a very low rateable value a qualified man would be simply wasted, and a glorified foreman would be all that was required. The more extensive the qualifications of a municipal engineer, the better he was able to carry out works at a minimum of cost. If a council, by paying a low salary, secured the services of a poorly qualified man, they had to pay in the increased cost of their works what they saved in the remuneration given. It was a bad policy, but apparently they could not be brought to see their folly. As to the question of taking outside work, he did not object to that. Everyone was entitled to make a living, but if a man was not sufficiently qualified he should refrain, and if he did undertake such work he should insist on being paid full professional fees. There was nothing worse than doing work at a price less than remunerative. He thought municipal engineers had the remedy in their own hands. It was frequently the case that when an appointment was advertised there were as many as 200 applicants. Even when there were only 100 probably at least 90 of those applying already had positions. Why should men want to apply for an underpaid appointment when they were already earning something that enabled them to live? If it were made the rule to disregard such vacancies the local authority would be compelled in the end to increase the salary. Even if four or five men did make application steps could be taken to bring them into line with the others.

The vote of thanks was passed.

Mr. J. S. Wooddisse (Shardlow) asked whether the whole question did not rest on the law of supply and demand. If they could cut down the supply of pupils the supply of engineers would be curtailed, and the demand would regulate itself.

Mr. J. Robinson (Darlington) agreed that it was impossible for a man to live decently on the salaries paid at present, and that he had no option, especially if he were a married man with a family, but to try and earn money in other ways.

Mr. E. Whitwell (Abersychan) said he had known of instances where the salary paid to the surveyor commenced at an amount even less than that paid to the road foreman.

Mr. T. Mundy (Woolwich) observed that, so long as surveyors made a practice of taking pupils for the fees they got from them, the market would continue to be overstocked, and councils would offer no better salaries, knowing that there would always be plenty of applicants for the positions they advertised.

Mr. W. O. Davis (Leominster) spoke of allowances for travelling expenses being regarded as part of salaries. This, he contended, helped to make salaries lower.

The President (Mr. Matthews Jones), in closing the discussion, agreed that it was the abundance of pupils who were continually coming out of their time who constituted the larger proportion of the applicants for vacant positions.

Mr. Chilvers, in the course of his reply, pointed out that if qualified men did not offer themselves for these low-paid positions the "local candidate" would, with the result that the local linen draper would get the job. If they did not try to make a step forward, they simply sat where they were for years.

Abattoir Floors.—It is evident that abattoirs must be constructed in such a way that the floors will be absolutely impervious to the penetration of wet of every description. It is therefore interesting to learn that the new abattoirs for the Leeds Corporation will be treated with the cement waterproofing powder "Pudlo."

"Thomas Hawksley" Lecture.—Mr. B. W. Bryan, M.I.MECH.E., chief engineer, South Essex waterworks, will deliver the above lecture (prepared by his father, the late Mr. William B. Bryan) on "Pumping and other Machinery for Waterworks and Drainage," as follows: London, at the Institution of Mechanical Engineers to-day (Friday) at 8 p.m.; Manchester, in the Portico Library, Mosley-street, on Tuesday next, at 8 p.m.; Birmingham, in the Medical Lecture Theatre of the University, Edmund-street, on Thursday next at 7.45 p.m. Visitors are invited.

L.C.B. and Surveyor's Grant.—With regard to a proposed grant of £150 to the surveyor to the Aldershot Urban District Council, Mr. F. C. Uren, for extra services in preparing plans and specifications in connection with the sewerage extension scheme, the Local Government Board have written that it was not competent for the council to pass such a vote. As an alternative the council have agreed to the board's suggestion that the surveyor's salary should be increased for a period by £150, payable in three sums of £50 out of the present and two following rates.

Institution of Municipal Engineers.

ANNUAL GENERAL MEETING IN LONDON.

The sixth annual general meeting of the Institution of Municipal Engineers was held on Saturday last at the Council Chamber, Southampton Buildings, under the chairmanship of the first president of the institution, Mr. Horace Boot, M.Inst.C.E., assisted by Messrs. Wilson and Wheatcroft. The members included the following: Messrs. W. Matthews (town clerk, engineer and surveyor, Chester, past-president), Horace Boot, M.Inst.C.E., M.Mun.E. (retiring president), F. A. Stockdale (president-elect), Henry C. Adams (vice-president), A. E. Richard (vice-president), John Robinson (vice-president), E. Whitwell (vice-president), T. Mundy (hon. treasurer), John Bailey Spalding, W. L. Cary (Ilkeston), G. Bates (Chilwell, Notts), John Davies (Mexborough), W. O. Davis (Leamington), F. W. Poynter (Watford), A. Palmer (Greenwich), F. Leslie Martin (London), G. F. Lowe (Leamington), W. Wallin (Newcastle), J. S. Wooddisse (Shardlow), and B. Wyatt (secretary of the institution).

The secretary read the minutes of the last meeting and these having been duly confirmed,

Mr. Boot said he would like to make a few remarks with regard to the past year's work. The progress of the institution had been satisfactory. The roll of membership had increased. They had a large number of members from all parts of the world, including Egypt, India, Australia, Canada, China, and South Africa, and the institution was thus acquiring a world-wide name. During the year the Mutual Defence Fund had been brought into operation. Several cases had been brought before them and carefully considered to see what action could be taken. He thought it would be within their memory or knowledge for what the fund was established, but he would like again to point out what its aim and object were. All municipal officials, or most of them, were subject to dismissal at the pleasure of their council. It was an uncomfortable feeling for a chief official, or for men in subordinate positions, to know that they might be discharged through no fault of their own, or rather at the whim of a council or committee. It was to see that such wrongs might be righted that the institution had established the Mutual Defence Fund. When they were paying their contribution to this fund they could feel that they were getting good value. Those of them that were in comfortable positions with their corporations would feel that they were doing all they could to help those who were not so well situated. Personally he would be pleased even if the fund required more money, for he would feel that he was doing all he could to help those who might not be so well off as himself. He thought they would agree, on reading the balance-sheet, that the financial position shown therein was satisfactory. He hoped they would also agree that the various reports and the number of meetings held were also satisfactory. Coming to the question of superannuation, the institution, as they were aware, had always manifested a keen desire to help the matter forward. A subject which did not meet with the general approval of the council was that relating to the associate class, and he would leave that for the future president to deal with during his year of office. As to the amendment of the by-laws and the alterations with respect to the scrutineers, this was the first year these had been put in operation, and the result, so far as they were able to judge, was satisfactory. On the question of premiums for papers he might say that, with respect to the papers he had submitted to him, he had read them carefully, and he, in conjunction with other members of the council, agreed that the result had been good. It was unfortunate that they should meet at such a particular period of English history. He referred to the war, which had not been sought by this country, but, on the contrary, had been brought about by the arrogance and pride of a certain class of the German people. Unfortunately, they who studied education, and hoped that this institution might be one of the leading lights of a special education and of the education of the people in general, could not help considering, with some dismay, that a war of such fearful bloodshed and inhuman deeds should take place between civilised nations. It led them to think that something more than education was required in the world. However, their heartfelt sympathies went out to the sons of the Empire who were fighting against an arrogant and insolent foe, [illegible] an unjustifiable war. It was satisfactory to know that the institution had taken its part in the war. The circular letter which he had the pleasure of sending out to the members had met with a hearty response, and to other communications, Captain Martin, would do them the honour of attending their informal dinner in the evening, so that the members would have the opportunity of seeing one of the men connected with the institution who was doing great work for the Empire. In conclusion he had only to say that the report of the institution, including the balance-sheet, was now open for discussion.

The annual report of the council, which was taken as read, was in the following terms:—

ROLL OF THE INSTITUTION.

At June 30, 1913, the roll of the Institution was 915 consisting of 728 members, 120 associate members, and 67 students. At June 30, 1914, the roll was 895, consisting of 704 members, 124 associate members, and 67 students. During the year 22 members, 13 associate members, and 7 students were elected, and 5 associate members were transferred to membership. The losses resulting from death, resignation, erasure by change of appointment and other causes amount to 51 members, 4 associate members, and 7 students.

FINANCES.

The accounts of the Institution have been audited, as on former occasions, by Messrs. Leake & Co., chartered accountants, and the balance-sheet, together with income and expenditure account, are herewith presented. The Council are pleased to be able to show again an excess of income over expenditure on the year's working, amounting in this instance to £36 5s. 6d., and making an accumulated balance of £392 4s. 6d., notwithstanding that during the year £100 has been laid aside as a provision against "irrecoverables." Two features of a satisfactory nature are the reduction in the amount of subscriptions overdue by £105 1s. 3d., and the reduction of current liabilities by £94 10s. 6d.

MEETINGS.

Three general meetings, ten Council meetings, and twenty-one district meetings were held during the financial year. There were also eight meetings of the Finance Committee and eight of the General Purposes Committee. The general meetings were held in London; the district meetings at Newcastle (two), Manchester, Carlisle, Chester-le-Street, Crowborough, Oundle, Leeds, Birmingham, Darlington, Finedon, Kettering, Oldham, Hull, Tisbury, and Leicester. One Council meeting was held at Newcastle and another at Manchester. All the other meetings were held in London.

PREMIUMS FOR PAPERS.

The premiums for the year 1913-14 for papers read before meetings of the Institution have been awarded as follows: President's premium (presented by Mr. Horace Boot) to Mr. Arthur Palmer for his paper "The Need for Standardisation in Drainage Details"; Institution premium to Mr. William T. Taylor for his paper "Greater New York's Water Supply Scheme."

PROVINCIAL COUNCIL MEETINGS.

Provincial Council meetings have again been held during the year, the meetings being held at Newcastle and Manchester. A good attendance was recorded upon each occasion.

N.A.L.G.O.

The delegates to the National Association of Local Government Officers for the year were Messrs. Latham, Pegge, Prescott, and Stickland.

SUPERANNUATION.

During the past year the National Association of Local Government Officers has made magnificent progress in all directions, particularly in connection with the Superannuation Bill. In June last the President of the Local Government Board received a deputation from the National Association, and, after hearing the Association's speakers, admitted in his

reply that there appeared to be a very good case for superannuation for all local government officers. Mr. Herbert Samuel promised the Association's representatives that he would immediately take up the question, and his first step would be to draw up a statement of the present position in regard to the superannuation of local government officers and to make mention of the various considerations he had stated in his reply, and to communicate with the organisations that represent the local authorities, and to ask their approval at an inquiry being made into the whole of the question. The President of the Local Government Board lost very little time in carrying out his promise to the Association. The Association of Municipal Corporations, County Councils Association, Urban District Councils Association, and Rural District Councils' Association have all been communicated with, and the next step will depend entirely upon the nature of their replies.

ROYAL SANITARY INSTITUTE CONGRESS.

It was decided that, in conformity with the practice of former years, the Institution should accept the invitation of the Royal Sanitary Institute to be represented at their congress, and Messrs. Bleazard and Finch were appointed delegates.

ELECTION OF CORPORATE MEMBERS.

Every application for admittance to corporate membership of the Institution is now submitted directly it is received to the District Committee in whose district the candidate may be. One month is allowed to the District Committee for consideration and report, at the expiration of which the application is considered by the Council. The Council feel that with this additional precaution the chances of the admittance of an undesirable member are very remote. The rule that the name of each candidate whose proposal for election has been approved by the Council shall be submitted to the whole of the corporate members of the Institution before final ratification (By-law No. 5) still obtains.

MEMBERSHIP BADGES.

It was decided that buttonhole badges, for the use of corporate members and students, be obtained and supplied at a cost not exceeding 1s. each.*

SURVEYORS' DUTIES.

The question of the overlapping of surveyors' duties by medical officers of health was raised by the members of the Northern District of the Institution, and the Council, having carefully considered the matter, passed the following resolution: "That this Institution considers that the whole of the duties in

Dr. BALANCE SHEET, JUNE 30, 1914. *Cr.*

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Creditors:			By Cash at bank		20 5 6
General	240 2 4		By Mutual Aid & Defence Fund:		
Subscriptions received in respect of the year 1914-15	33 13 0		Cash at bank	14 11 5	
		273 15 4	Cash in hand	5 0	
To Mutual Aid & Defence Fund, see contra		15 16 5			15 16 5
To Income and expenditure account:			By Debtors:		
Balance as per balance sheet at June 30, 1913	35 19 0		Subscriptions overdue	520 3 0	
Add:			Advertisements	22 7 9	
				552 10 9	
			Less Reserve against bad debts	132 14 6	
Surplus of income over expenditure for the year ended June 30, 1914					419 16 3
Transferred from Income and Expenditure account	36 5 6		By Stock of stationery, by-laws, certificates, &c.		36 8 6
		392 4 6	By Office furniture, engraved plates, &c.		102 10 1
			By Library (excluding presentation copies), less depreciation		77 1 9
		£681 16 3			£681 16 3

Dr. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED JUNE 30, 1914. *Cr.*

Expenditure.	£ s. d.	£ s. d.	*Income.*	£ s. d.	£ s. d.
To Expenses of management—			By Subscriptions, year ended June 30, 1914:		
Salaries, secretary and assistant	328 0 0		668 members at £1 1s. £701 8 0		
Rent	30 0 0		8 members at 10s. 6d. 4 4 0		
Printing by-laws, certificates, examination syllabus, &c.	49 7 4			705 12 0	
Legal expenses	30 2 6		117 associate members at £1 1s. 122 17 0		
Stationery and books	31 18 6		3 associate members at 10s. 6d. 1 11 6		
Telephone	5 10 0			124 8 6	
Premiums	8 8 0		67 students at 10s. 6d. 35 3 6		
Postage	52 4 2		— students at 5s. 3d. —		
Depreciation of library books	10 17 9			35 3 6	
Affiliation fees, N.A.L.G.O.	5 5 0				865 4 0
Other expenses	44 19 11		By Entrance fees:		
		656 13 2	Members	30 9 0	
To Meetings and conferences	—	62 6 9	Associate members	13 13 0	
District committees	—	13 9 4	Students	3 3 0	
Journal—					47 5 0
Cost of production and distribution	83 17 0		By Donations	—	4 4
Deduct—					
Advertisements and sales, less commission paid	53 10 1				
		30 6 11			
To Depreciation of office furniture, &c.	—	17 11 4			
Bad debts, reserve against loss	—	100 0 0			
Balance, being surplus of income over expenditure for the year ended June 30, 1914, transferred to balance sheet	—	36 5 6			
		£916 13 0			£916 13 0

LEAKE & Co. (Chartered Accountants), Auditors.

the construction, maintenance and cleansing of roads and sewers, and in the removal of house refuse, are duties appertaining solely to the engineering and surveying department of a local authority, and in support of this opinion refer to the Local Government Board Order of July 25, 1913, where reference is made to the removal of house refuse 'under the supervision of the surveyor.'"

HIGHWAY ENGINEERING.

A letter from the Roads Improvement Association, enclosing a copy of one by Mr. Percy Boulnois on "The Need for some Special Training of the Road Engineer," was considered by the Council, and the secretary was instructed to reply that the Institution fully recognised the importance of the matter, and in fact had, for some years now, conducted a special examination in highway engineering, such examination being under the control of a board of eminent engineers. Application was made later to the Insti-

* These have now been made and are on sale at 1s. each.

[illegible] to the Roads Improvement Association for the appointment of a representative to act upon a [illegible] which was [illegible] to [illegible] the [illegible] of the [illegible] and Mr. E. A. Stickland was appointed.

ARCHITECTS' REGISTRATION BILL

The Architects' Registration Bill was before the Council and the General Purposes Committee on several occasions, and its provisions were very fully considered. As a result, the Council decided that the Institution oppose the Bill unless municipal engineers [illegible] from its operation, and the Society of Architects were informed of such decision. It was then proposed by the Society that a conference of representatives of the two bodies be held, and this course has been agreed to. The conference has not yet been held.

WAR OFFICE AND MOTOR LORRIES

Certain correspondence and printed matter from the War Office with reference to a subsidy scheme for motor lorries was considered by the Council, who decided that the scheme should be noted in the pages of the Institution Journal, with the advice to members requiring further information to communicate direct with the Department. The reference to the scheme appeared in the November, 1913, issue of the Journal.

MUTUAL AID AND DEFENCE

As foreshadowed in the last Annual Report, the scheme for the creation of a Mutual Aid and Defence Fund upon a compulsory basis received the approval of the members convened at a Special General Meeting, and the fund is now being satisfactorily worked, members and students remitting their contributions with their annual subscriptions. Four cases have received the attention of the Council during the year. In one of these cases Mr. Stickland and the secretary were granted a special interview with a prominent official of the Local Government Board, at which the matter was very fully gone into and certain representations were made. In two other of the cases the opinion of the solicitors to the Institution was obtained, and in the remaining case the points at issue were satisfactorily arranged without the necessity for either interview or legal assistance. The question of the administration of the fund is now receiving the serious consideration of the Council.

ASSOCIATE CLASS.

The proposal to institute an Associate Class was before a Special General Meeting, and was sent back to the Council for further consideration. It was then decided that a postal vote should be taken upon it, and Messrs. A. H. Jennings and A. N. Hudswell were appointed scrutineers. They reported that the voting was: Affirmative 105, negative 61, neutral 10, spoilt papers 4; total 180. Owing to the intervention of neutral voting the affirmative votes (for the formation of the class) fell short by a fraction of one vote of the three-fifths required by the by-laws, and the proposal was therefore lost. No further steps in the matter have since been taken.

BY-LAW AMENDMENTS AND ADDITIONS.

At the Special General Meeting referred to above certain amendments and additions to the by-laws were proposed for adoption, and all were carried with the exception of the one relating to the proposed associate class. These amendments and additions came into operation on January 1st, and a by-laws addendum sheet has been issued to corporate members and students.

Mr. A. E. Stickland proposed that the report and balance-sheet be adopted. The president, he said, had gone through a number of items in connection with the papers, and he (the speaker) did not think there was much for him to say. He would say, however, that he did not agree with Mr. Boot when he stated that the membership had increased, for he found that the number was twenty-two less than last year. This was rather unfortunate, because an institution of this sort should not be on the retrograde track; their motto should rather be "Forward!" He hoped that when they were adopting their next balance-sheet they would be able to report that they had recovered their lost membership.

Mr. H. C. Adams seconded. With regard to the matter referred to by Mr. Stickland, it should be distinctly understood by the members that the institution had adopted a very strong line in regard to the non-payment of subscriptions by promptly removing from the list those who dropped behind. It was better to show a decrease of twenty-two members who had failed to meet their obligation than to show a book increase of members who might not pay.

The report and balance-sheet were then adopted, and the result of the ballot was announced as follows:

THE COUNCIL, 1914-15.

President: W. H. Matthews Jones, city engineer and surveyor, Chester.

Past-presidents: Ernest Albert Stickland, assoc.m. inst.c.e., borough surveyor, Windsor; Frank Latham, m.inst.c.e.i., borough engineer and surveyor, Penzance; Horace L. P. Boot, m.i.e.e., m.i.mech.e., consulting municipal engineer, 7 Victoria-street, S.W.

Vice-presidents: Henry C. Adams, m.inst.c.e., m.i.mech.e., f.r.san.i., consulting municipal engineer, 60 Queen Victoria-street, E.C.; A. R. Bleazard, borough engineer, Clitheroe; Arthur Bowes, assoc.m. inst.c.e., surveyor, Newton-in-Makerfield Urban District Council; H. J. Farmer, borough surveyor, Christchurch; William Finch, county surveyor and bridgemaster, Cumberland; John Robinson, surveyor, Darlington Rural District Council; Edward Whitwell, engineer and surveyor, Abersychan Urban District Council.

Hon. Treasurer: Thos. Mundy, deputy borough engineer, Woolwich.

Ordinary Members: John Bailey, surveyor, Spalding Urban District Council; Willie Bevan, borough surveyor and waterworks engineer, Haverfordwest; Walter Louis Carr, engineer and surveyor, Ruislip-Northwood Urban District Council; G. Belson Chilvers, surveyor, Oundle Urban District Council; Frank Cutler, deputy borough surveyor, Deptford, S.E.; E. Plummer Davies, engineer and surveyor, Tisbury Rural District Council; John Davison, borough surveyor, Morpeth; Arthur James Elson, deputy engineer and surveyor, Penge Urban District Council; Frank E. Ennals, surveyor, Billericay Rural District Council; Douglas C. Fidler, engineer and surveyor, Hayes Urban District Council; A. Winter Gray, senior assistant, borough of Lambeth; Ernest W. Hearn, borough engineer and waterworks engineer, Chard; Henry Hulse, borough surveyor and engineer, Droitwich; Rhys Williams Jones, county surveyor, Carmarthen (Western); John Lewis, surveyor, Yiewsley Urban District Council; Colin H. Macfarlane, burgh engineer, Rutherglen; Herbert William Marsden, borough surveyor, Richmond, Yorks; Charles F. Mayfield, borough surveyor, Godmanchester; John T. Pegge, city surveyor, Durham; Frank A. Pratley, surveyor, Epsom Rural District Council; H. C. H. Shenton, civil engineer, 28 Victoria-street, S.W.; John T. Shield, deputy borough and water engineer, Blackburn; George Symon, surveyor, Blaydon-on-Tyne Urban District Council; John Taylor, sanitary surveyor, Uckfield Rural District Council; David Thomas, engineer and surveyor, Ammanford Urban District Council; Charles Turton, surveyor and engineer, East Grinstead Rural District Council; W. T. Unwin, town and district surveyor and architect, March Urban District Council; William Wallin, consulting municipal engineer, Newcastle-on-Tyne; Henry J. Weaver, consulting municipal engineer, Gloucester.

The President stated that Mr. Harrison Halstead had withdrawn his name because he was unable to serve.

NEW PRESIDENT'S INSTALLATION.

Mr. Boot then said his next duty was to vacate the chair, but before doing so he would first of all like to thank the whole of the officers, particularly the hon. district secretaries, the secretary, and the various chairmen of District Committees, for their courtesy and kindness, and the energy they had displayed during the year. It had been indeed a pleasure to have so many able lieutenants to render assistance, and he could assure the incoming president that if he were only served as well as he (Mr. Boot) had been he might have no fear for the progress of the institution. He would like before vacating the chair to say a few words with respect to the incoming president. Mr. W. H. Matthews Jones was well-known to him, if not personally, by name, as the city engineer of one of the most interesting cities perhaps in the kingdom. Chester had always been known as one of the best kept and cleanest of cities, and a place whose other features were sought after. It was also interesting to know that Mr. Jones's father was borough engineer of Chester before him, and he was therefore

carrying on the good work of his father. He was a junior in the borough engineer's office, and rose through various steps until now he held the important position he did. During his occupancy of the office Mr. Jones had carried out important works in connection with sewage disposal, roads, and many improvements involving the expenditure of large sums of money. Some years ago, when he (Mr. Boot) was quite a young man, he had the pleasure of visiting the city of Chester, and he remembered very well remarking to some American friends who were with him that he did not know who the city engineer was, but that it was quite evident that in Chester they had an extremely good man, little knowing that to-day he would have the pleasure of installing the same gentleman in his place as president of this institution. He wished Mr. Jones and the institution continued success for the future. He felt certain that the new president would leave no stone unturned to achieve that object. He thanked the members for the kindness they had shown him during the past year, and he had pleasure in asking Mr. Jones to take the chair in his place.

Mr. Boot forthwith vacated the chair, and Mr. Jones assumed the presidential office amid applause.

THANKS TO THE RETIRING PRESIDENT.

Mr. W. Wallin, in proposing a vote of thanks to the retiring president, said he was a stranger among them, coming as he did from the North of England. As regarded Mr. Boot, he thought they would all agree that he had taken an exceptional amount of interest in the affairs of the institution. There had been no trouble and no work he had not entered into heart and soul. When they held their dinner in the Northern District they were sorry that, through indisposition, Mr. Boot was unable to be present. If Mr. Boot had been present he would have realised that, though the Northern contingent of members were a long way from those in the South, they were united as most enthusiastic workers for the institution. As to the various points mentioned by Mr. Boot in his retiring address, the question of the Defence Fund, they would agree, was of the highest importance. It was very difficult for the surveyor of any council to do his duty without bringing trouble upon himself. Some officials were in what might be termed a happy position, but this could not apply to the surveyor. To afford some measure of protection they were forming a good substantial fund for the defence of members. In the case of many urban councils, some members—the majority—supported the surveyor, but there were sometimes awkward customers to deal with, such as builders with personal interests at stake, and it was such as those who caused trouble. With regard to superannuation, he thought that was a question that should be taken up again by the institution, and he felt sure that their incoming president would give his attention to this. He did not know that he could add much to what the retiring president had said, except to say that he deserved a hearty vote of thanks at their hands. Unfortunately, the latter end of Mr. Boot's term of office had been disturbed by the awful war which was bringing havoc to everything and everybody. Many of them would like to know that they were doing something for their country, but they must bear in mind that the health of the community was just as important to those who were left behind as was the work in the trenches at the front. If they were all to go to the front there would be nobody to look after the home work, and they had therefore the satisfaction of knowing that though they did not all don khaki they were doing everything in their power to maintain in efficiency the various works that belonged to local administration.

Mr. H. C. Adams seconded the proposition, and remarked that if anyone deserved their thanks it was certainly Mr. Boot. He had been most assiduous in his attention to the work of the institution during his year of office. He had, in fact, created a record in the number of provincial meetings he had attended, and he (the speaker) must say he had often marvelled how he had managed to sandwich his presidential duties in with his private engagements in various parts of the country. At their council meetings he had always presided in the most impartial manner over the discussions. Each had his views, and no one on the council hesitated to advance them for the common good. It had certainly been a pleasure, so far as he was personally concerned, to work with Mr. Boot, and he thought he could speak for every member and say that they had had a most happy year under his guidance.

The vote of thanks was passed with acclamation.

Mr. Boot, in response, thanked the members one and all for their vote of thanks. In doing what he had done he had only carried out his duty. He took the office of president knowing the importance of the position, and he felt that any man who took up the presidency would, like himself, appreciate the duty that was imposed upon him. His one regret was that business had prevented him from attending many of the district meetings, for he might tell them that he found it sometimes impossible to sandwich his professional duties in with the business of the institution. When he accepted the office he thought it might be possible to attend all the meetings, but it sometimes happened that, say, at Manchester, his business engagements prevented this being done; but he had sought to do his duty as well as he could, and he could say conscientiously that he thought the hon. district secretaries had done quite as much as he had for the institution. He hoped their new president would carefully consider the question of the tenure of office of municipal surveyors. He could not for the life of him see why certain chief officials in a town should be protected by the Government while other chief officers carrying out far more important work should hold office at the discretion or whim of the local authority. He referred to such officials as the medical officer of health and the chief constable, whose offices were not held at the whim of the council, although the appointments were made by the council. Before either of those officers could receive an intimation that they were not required, a proper report had to be made to the Government stating the reason, and they could have an inquiry held into the matter. He suggested that borough engineers and surveyors, electrical engineers—in fact, all chiefs of the various municipal departments—should have the same right as the medical officer of health and the chief constable. He thanked them very much for their kind vote.

A VOTE OF CONDOLENCE.

The secretary (Mr. B. Wyand) read the following letter, dated November 27th, from Mr. Frank Latham, past-president:

"Since my letter to you I have found it absolutely impossible to get away to attend the annual general meeting of the institution to be held in London. As I have already stated in my former letter, owing to the war, I have many additional duties thrust upon me, three of my assistants having left to join the colours. I have, however, delayed writing to Mr. W. H. Matthews Jones, thinking that family business might have called me to London, but I am not so fortunate. My brother, who has served his country in the London Scottish, successfully passed through the great charge of the 31st ultimo, and fought up to the 5th inst., which was the last date of his communication with me, and, knowing that he kept me well informed, the sudden absence of a letter made me fear that he might have been wounded, and that the next information would be that he was brought home to hospital. But, sad to say, last night I received an unofficial communication through the London Scottish that my poor brother has been killed at Ypres. I am afraid that the tidings are only too true. It is too sad for words; but I have the consolation of knowing that he did his duty, and as a wonderful marksman and most powerful man he must have done his share in the magnificent stands made by that splendid regiment. Under the circumstances I am deprived of embracing the opportunity of visiting London which I have been anxiously waiting for, and I can merely meditate on the fact that there are others besides myself who will have to face bereavement in the midst of anxious hope and suspense. Please convey my best wishes to the president-elect, hoping that his year of office will gather brightness as it proceeds, and that at the conclusion he may have the satisfaction of knowing that both the country and the institution are buoyant, and the nation's temporary distress changed into rejoicing."

In a postscript written on the outside of the envelope Mr. Latham added: "Letter just come. My poor brother blown to pieces by a shell."

The President stated that he had received a letter from Mr. Latham in practically identical terms to that just read. Mr. Latham was a personal friend of his, and he valued his friendship very much. He did not think they could do less than send that

[illegible] Mr. Latham.

Mr. [illegible] Mr. [illegible] Mr. Latham, though sorrowing for his brother's death, [illegible] a brother, a son of the Empire, who could do his duty. Mr. Latham was always a great friend of the institution, and they could not do better than offer him their condolence in his sad loss. They should at the same time convey to Mr. Latham that the institution were proud of the fact that his brother had died in doing his duty.

The vote was passed in silence, the members standing while it was being put.

The president then proceeded to read the annual address in the following terms:—

PRESIDENTIAL ADDRESS.

After [illegible] in the [illegible] how deeply I appreciate the honour the members of the Institution of Municipal Engineers have conferred upon me to-day in electing me as their president for the coming year. I shall endeavour to the best of my ability and with the time at my disposal to further the interests of this institution, so that I shall leave it when my year of office is over in a more flourishing condition, if possible, than I find it. You have in the few years since the institution has been founded elected as your presidents men well up in the profession of engineering and surveying, who have done great things and are still prepared to do great things for such a society as ours, and our thanks are due to these gentlemen for the time and energy which they have devoted to our cause. This year, owing to the war which is taking place, the duty of a president is not an envious one, but wars will have their day as other [illegible] English men must do their duty in supporting what I consider a just cause, and do all we can for the protection of our country by carrying on our works, and, if able to bear arms, to help our friends of foreign countries against that nation which considers itself all powerful, and which, in carrying out its ambitious schemes, would seem to have forgotten all the dignity of its birth and upbringing in the atrocious deeds it has performed to try and gain its ends. They have destroyed in a wanton manner villages, towns, and priceless treasures in the way of architecture and art, and it can only be hoped that the enemies of the Allies will suffer complete degradation in the near future.

This year it was intended to hold our annual meeting at Chester, and an interesting programme had been drafted out for a two-day meeting, and his Worship the Mayor of Chester, Mr. Alderman John M. Frost, had agreed to give the members a civic welcome, but owing to the war this arrangement was cancelled. At the council meeting held in October it was decided that the annual meeting should be a business meeting only and held in London, but your council hope that next year they will be able to hold the meeting in the town from which your president will be elected.

I am personally very glad to see that our institution is progressing, and that due care and consideration are given to applications made for admission, and that only applicants whom the council consider have had sufficient experience in the engineering and surveying profession are admitted. I think that even stricter lines might now be instituted as to admission into the institution.

The work of those gentlemen connected with the various branches of municipal work must of necessity be varied, as they have to keep in touch with the modern requirements which from time to time are brought about by the greater knowledge and thought which are always being given to municipal matters. Necessity, it has been said, is the mother of invention, but competition is now running necessity a very close race.

With the demand by a more educated and strenuous community, who now have in their minds a much higher standard of sanitation, and who do not always look at the present, but at the future, the responsibility of surveyors and engineers to local authorities is ever on the increase, and municipal works have to be carried out in a different manner to what they were fifty or twenty years [illegible] planning [illegible] the thoughts and energies of hundreds of engineers and members of councils, and in the future development of lands into building areas will be such that slums, courts and alleys will be done away with and only healthy [illegible] with trees, &c., will exist, and it is the duty of all local authorities, with the help of their official advisers, to see that only such schemes are carried out as will be of benefit to the coming generations. I have attended town planning conferences, and in the majority of cases great attention has been given to roads and road construction, and whether such roads are to be main or secondary roads.

My contention has been, and still is, that the question of main roads is the first thing that should be given consideration to before any town planning is taken in hand by a local authority, and I believe the county council of a county should lay down for guidance, on a map of their county, the approximate position of all new and intended new roads. If each county were to do this and agree as to the lines of such roads, we should have a main road plan of England and Wales which would considerably help us in our deliberations, and the subsidiary roads in each local district could be laid out to couple up with such main roads. As an example, take Chester. Chester itself (not the county of Chester, but the city) is bounded by Cheshire, Flintshire and Denbighshire, and how is it possible for such a town to lay down the lines of main roads for itself under the conditions which exist?

Then we have the question, as I have already stated, of better sanitation, as well as that of better drainage and sewage disposal, and to these must be added the making of streets to meet the requirements of modern road traffic, building by-laws, the removal and disposal of house refuse, tramways, public baths and wash-houses, infectious diseases and tuberculosis hospitals, housing of the working classes, and many other matters. In dealing with these I do not intend to discuss them at length, but just to say a few words on each.

SANITATION.

So far as the surveyor of a town is concerned, the sanitation of the town for which he is responsible should be his first consideration. Streets, back passages, and all waste pieces of ground should be kept free from noxious substances, and all matters appertaining to the health of the neighbourhood (such as these) should have his first attention. If the streets and back passages and waste pieces of ground are kept in proper order the health of the district must be improved.

DRAINAGE AND SEWAGE DISPOSAL.

During recent years great advance has been made in the question of drainage and sewage disposal, and one could take up an immense amount of time in writing on these subjects, but I shall content myself by saying that drainage has become a science, and very careful consideration should be given to schemes before being carried out. Proper-sized pipes should be used, with proper and regular falls, and all joints should be evenly made and cleaned inside. It is astonishing to find on looking down some drains the amount of cement there is left at the joint inside a pipe, although the surveyor or his drainage inspector is told by those persons responsible for the laying of such drains that they have been thoroughly cleaned out. This cement at the joints as often as not causes stoppages and expenditure, but it must be remembered by persons having property being built or drains laid that the surveyor who comes round to inspect and finds fault with bad workmanship is really doing him a good turn and not an injury, and if I were in that happy and prosperous position of being able to build property I should have in my contract conditions a clause to the effect that any bad workmanship (and more especially that in connection with drains) ordered to be re-done by the surveyor of the local authority shall be re-done at the expense of the contractor, and not at the expense of the building owner.

All drains should have proper inspection eyes or chambers where a change of direction takes place, and should be subject to a water test, both before and after they are covered in. Men would then be more careful in the filling up and ramming of a trench so as not to break the joints, because if on the second test being applied to the drain it was

found faulty it would have to be uncovered and often broken pipes repaired.

All new buildings should be separately analysed into the sewer, if it is possible, and not in the case of a block where the drainage of one building perhaps up to another and so on until no one knows exactly where the drains go.

The drainage of premises is often not carried out as shown on the plans submitted, and it is therefore absolutely necessary for future information that all drains and sewers should be carefully surveyed and put down on a block plan of a scale not less than 16 ft. to 1 in., showing the line of the pipes, the position of inspection-eyes and junctions, and the size of the pipes and their falls. A record of the tests made, how and by whom, should be endorsed on the plan for future reference.

All soil pipes, water-closet connections and ventilation pipes should be tested by a smoke test under pressure.

The question of an intercepting trap is a very open one, but for my part I do not like an intercepting trap on the line of any drain, and I have never asked builders to put one in. I believe that in the very near future building by-laws will leave it to the discretion of the builder or the person who is having the building erected whether an intercepting trap shall be provided or not.

SEWAGE DISPOSAL.

This is, of course, a question that cannot be written about in a paper of this description, for what would suit, say, Chester in a matter of this kind would not suit ninety-nine other towns. It is one of those questions which must be considered by the engineer or surveyor on its merits when it arises, and if the Royal Commission's Reports on Sewage Disposal are followed, there cannot be many difficulties which cannot be overcome.

MAKING OF NEW STREETS FOR MODERN ROAD TRAFFIC.

Now we come to a question which is a vital one to all surveyors who have the control of roads or streets. It cannot be denied that in ancient times the Romans knew how to make good roads, and how to lay them out, for we have many examples of Roman roads in England at the present time. It is well known that when the Romans decided to lay out a camp their roads were always laid north and south and east and west; but in later years roads and streets seem to have been made more or less on the line of old bridle paths and such like, and within the last twenty years streets have been inserted in between lines of buildings and on little pieces of vacant land indiscriminately and without any thought of the future. Streets will have now to be laid out on proper lines. We shall, as surveyors, have to see when a plan of an estate is submitted showing proposed roads, that they are laid out not only to suit the particular estate, but that they will suit the adjoining estates when they in turn come to be developed; but perhaps I am getting a little bit away from my subject, and am getting on to town planning questions.

When one comes to deal with the construction of streets, we have to think of the time when only a horse, mule, donkey or ox drew a wagon, and then to think of the present day, when a traction engine or motor will haul two or three wagons each carrying 20 tons weight or more, cutting up the roads which were never constructed for such traffic. The expenditure on roads to-day is enormous, and local authorities are groaning under the heavy burden they have to bear and to extract from the unwilling ratepayer to meet the demands for road maintenance. Chester is a town through which a tremendous amount of motor traffic passes from Liverpool, Manchester, and the North of England to Wales, and I know, to my sorrow, the damage my roads sustain through this kind of traffic; but what about a town like Warrington, where, on the main road through the town, there is practically a continuous flow of traction engines and motor lorries passing between Manchester and Liverpool. No ordinary water-bound macadam roads can stand this kind of traffic for long, and it is therefore up to the surveyor to construct such roads in his town or district as he may think best to suit the particular traffic which passes over them, but always having in mind what is likely to come his way in the future, and I would like here to impress upon you the necessity of not trying to put in a cheap road because your neighbour constructs a cheap road. Make up your mind as to what you require, and although you may be told that so-and-so has made roads for such and such a price, do not be misled by people who have no further responsibility in such matters except to grind and grumble, and who will say "I told you so" if you adopt a cheeseparing, false and economical view.

During the five past years it is astonishing to hear of the number of patent road materials which have been produced, and how the agent of one will tell you how much better his material is than the man who came along first, and if surveyors were to try every new road material, whether as a dust preventive or as one of a non-wearoutable nature, he would soon find his materials in for a very large expenditure.

In Chester I have stuck to one thing, and that is tar-spraying, for my macadam roads—not gas tar straight from the gasworks, but distilled tar of various distillage, and the firm who supply me have given me three classes, which I call A, B and C, and I do not put these on my roads indiscriminately. Records are kept, and if I find that A or B or C of themselves are not right, then I mix so much of A, B or C, and carefully measure the quantities, taking the atmospheric temperature as well as the temperature of the tar when being put on the roads. Having for two or three years made a careful study of this I have now arrived at a definite conclusion as to what amount of tar shall be put on the various roads to suit the traffic which goes over them, and it is only by a careful study, and making up of one's own mind as to the best course to adopt that one can give general satisfaction.

The various road paving materials are too numerous to mention, but we have seen wood paving, granite and other setts, asphalt, brick and many other materials, and I am of the firm opinion that granite setts properly laid on a solid foundation will surely come back as the most cleanly and lasting of street or road surface paving that can be had, and if such paving is tar-sprayed or tar-painted, and the joints well filled up, it becomes almost noiseless.

I have recently, and still am, carrying out experiments in another direction of road making—viz., armoured concrete roadways—which have, up to the present, given the greatest possible satisfaction; and here, again, when one has studied the question in all its aspects, one is led to believe that all county main roads will be done on these lines in a few years from now, and if the surface of the concrete is allowed to set before traffic goes over it, I believe we shall not only have a more sanitary and watertight road surface, but even a dustless one.

It is not fair to compare prices of various classes of roads, as the price one surveyor pays for his materials may not be the same as that paid by another surveyor; but I can give an actual comparison between a reinforced-concrete road and an ordinary water-bound macadam road on a 9-in. rock or brick pitched foundation in Chester. The reinforced-concrete road, 6 in. of concrete being used and afterwards tar-sprayed, costs to lay 3s. 11d. per super. yard, and the water-bound macadam costs 6s. 10d. per super. yard, exactly the same price being paid for the broken granite used to form the matrix in both cases.

If anyone would like to have further information on the subject of reinforced-concrete roads, I shall be very pleased to let him have it, as I have constructed four streets in Chester on this method, but I always advise the surveyor using reinforced concrete carefully to study the traffic conditions, and not go haphazard at it and lay, say, 6 in. where 8 in. or 9 in. of concrete may be required.

BUILDING BY-LAWS.

At the present time building by-laws have not sufficient elasticity to enable the surveyor or building inspector to use his better judgment, and I often think that many buildings in their erection are spoilt for the want of this elasticity; but there we are, the law is passed and so we must abide by it. We surveyors cannot say to a builder, "Well, yes, you can do so and so," but which may not be in strict accord with the by-law, however. Where we have building by-laws the surveyor should master the same, so that when he is asked by an architect or builder if he can do so and so, the answer should be given at once, and not "Well, I shall have to see what the by-laws say," for, in my opinion, when this is done, it rather goes to show that you are wavering in your own mind as to

[illegible] what is right or wrong and [illegible] I should like to see more [illegible] of the surveyor in the building [illegible] in this country [illegible] being [illegible]

[illegible]

[illegible] of this municipal work, whether the surveyor or the [illegible] I always [illegible] that the [illegible] If not, the medical officer of health of the district, if [illegible] of health has never been brought up to control men [illegible] the men feel that they ought to go home and put on their Sunday clothes and wear a pair of kid gloves to carry them out. However, I cannot yet see the work of refuse removal being taken out of the surveyor's department. If it does come in any town I should like to see the difference in cost of removal and the complaint book's record at the end of twelve months.

The method of removal in various sized towns must of necessity vary, and where motor lorries can be used economically and efficiently this must, of course, be the best way for the quicker transit of foul-smelling refuse through the streets.

Again, there is always trouble and time wasted in removal of refuse from the main thoroughfares in a city. Many shops and dwelling-houses combined do not open their premises until 8.30 or 9 o'clock in the morning, and by the time the shop has been swept up and the refuse put in the bin it is 10 o'clock, and I think there is nothing more objectionable to the man in the street as he comes in to his office than to see and have the odour of a refuse cart thrust at him. The remedy, of course, lies with the shopkeeper.

The method of disposal generally adopted in this country is that of cremation, but some towns use their refuse for raising low-lying land, as at Chester. My [illegible] with an estate of 400 acres of land which is very level, and only between 14 and 15 ft. above ordnance datum, and here we dig the ground out to a depth of 2 ft., fill in with refuse, and cover with the 2 ft. of earth already excavated, raising the ground level to not less than 20 ft. above ordnance datum. In two or three months after completion of an area we let it off as allotments, or it is taken over by the farmer of the land in whose occupation the field was before we started to tip. Good crops are obtained, and the Local Government Board do not object to this method of treating refuse where low-lying ground can be obtained and improved by raising.

The removal of trade refuse is becoming a serious matter in many towns, and I believe in some cities a charge is made for trade refuse removal, but this charge generally leads to a great deal of controversy between the official responsible for such removal and the tradesman, for in many cases the question arises as to what is trade refuse in small shops with houses or dwellings attached and what is house refuse. In Chester we remove all trade and house refuse, but not garden refuse.

TRAMWAYS.

So far as maintenance of permanent ways is concerned, this is becoming a very serious matter with many small local authorities, and Tramway Committees in many cases are faced with heavy expenditure on tracks owing to corrugation of rails and the giving way of foundations due to the heavy traffic passing over them. I have no doubt many surveyors who are responsible for tramway tracks have noticed how heavy traction engines and motor lorries, as well as horse-drawn vehicles, will utilise the tramway track to run along in preference to the macadamised portion of a roadway adjoining a track, and thus put wear and tear on the track for which it was not designed, breaking away portions of concrete foundations, and especially that portion under the outer rails on the up and down tracks.

Again, loose rails are a great source of worry and annoyance, because rails when once they become loose cannot be properly and securely refastened to the old concrete foundations. In my opinion many [illegible] and expansion of the metals, and I have known in Chester where a 60-ft. length of rail has been taken out first thing in the morning and when it has come to be replaced, say, in the middle of the afternoon, and the sun has been fairly hot, it would not go into its original place by 2 in. I do not say, however, that a rail which is buried in setts and partly in concrete will expand at the same rates, but I have seen a cold night carefully watched joints, and in many cases a penny could be placed edgeways into such joints, yet at midday following, when the sun has been upon the track, it has taken all one's time to find them, a mere hair-line being the only indication. This must cause to some extent the lifting of the rails, and in my opinion this lifting of the rail from its bed, although very, very slight, often causes the [illegible] track, and in some measure the [illegible] perhaps the first cause of corrugation. It might be argued that when laying a track the joints, like a railway line, should be left more open, but this soon causes bumping and knocking, which in turn damage the tyres of the car wheels. It may perhaps be thought by some that in what I am about to say I am going back to ancient days, but I do say, and say it very seriously, that if I had to relay a track I would consider the laying of it on heavy creosoted sleepers, which in turn would be laid on not less than 6 in. of (and in) concrete. By this method, if a rail became loose, all that would be necessary would be to take up the rail, relay it on the sleeper, and re-anchor it down.

PUBLIC BATHS AND WASH-HOUSES.

In thickly populated areas and working-class districts I believe both public baths and wash-houses to be an absolute necessity, and they should be provided by the local authorities; but in residential districts public baths and wash-houses are not so necessary. We all know, however, that in the majority of towns public baths do not pay from a financial point of view, but the excellent amount of good they do in teaching the younger generation the art of swimming should be ample recompense to any local authority for such financial loss.

INFECTIOUS DISEASES AND TUBERCULOSIS HOSPITALS.

When these are being considered by a council they should be built on a site convenient to the town, especial care being taken not to have them on one that is low or likely to be crowded in by buildings which may be erected in years to come, and sufficient ground should be purchased to allow always of plenty of space being left around.

In my opinion tuberculosis hospitals or sanatoriums should not have too much money spent upon them, and such buildings should be more of a temporary character than of a permanent one, for we read that if proper precautions are taken all over the country at about one and the same time the terrible scourge of tuberculosis ought to be stamped out in twenty to twenty-five years. Therefore, it is no use erecting buildings that are likely to stand for 100 years or more, because we shall find, with the knowledge that is to come, that a sanatorium building erected now will in twenty years be more or less obsolete.

HOUSING OF THE WORKING CLASSES AND TOWN PLANNING.

These two, in my opinion, should go hand in hand, for to design the one without the other is only likely to cause dispute hereafter, and I do say that a good housing scheme cannot be designed unless it is done on town planning lines. Let the houses have plenty of air space surrounding them, not necessarily excessively wide streets, but streets wide enough to allow of trees being planted, and having grass margins, and give gardens back and front. Design and build your houses in blocks of threes and fours, and never have more than six in a block. Provide sufficient ground when purchasing land for a housing scheme to allow of allotments being formed for those working men who are interested in gardening. I know some working men in Chester who have allotment gardens about 1½ to 2 miles from their homes. This is too far, and I remember asking one man some little time ago how it was he took such an interest in his garden, especially after doing his day's work, and he replied that he looked upon it as a recreation, and that he could stretch his back when he felt inclined without being afraid of hearing his foreman or boss shouting, "Nah then, yer at it again, are yer?" It got the "missus" in the habit of coming out a bit, too, and "sometimes she brings the kid as well." I said, "You surely lose money on a

garden like yours? . . . he has a 5 acre allotment, for which he pays £2 a year. Oh, no,' he said, "that's where you are wrong. I easily make the rent out of what I get in the way of vegetables, and I grow enough potatoes and greens to last our family all the year round, and we always get them fresh."

This conversation is quite a true one, for it was one of my own workmen to whom I addressed the question, and I gave vent to the conclusion that allotment gardens are not only a pleasure, but in many cases a help to a working man's wage.

With regard to town planning, so much has been said recently that anything I could say on this matter would only be repeating what has already been stated on the subject, except that I should like to press upon all surveyors (especially in rapidly developing districts, too numerous) the adopting a "town planning scheme for the protection of his district. If he will read, if he has not already done so, the Town Planning Act, he will find it gives his council such powers as to acquiring open spaces and only allowing of so many houses to be erected to the acre, that his district, instead of being a slum area, will in a few years be a "Utopia" in more ways than one.

In writing my address I have tried (more in the way of a friendly chat) to bring to your notice a few of the many pressing questions which are always before the notice of surveyors to local authorities and their assistants and members of their staff. We have all to keep abreast of the times, for no sooner do we do something than someone improves on what we have done, and so we go on doing something to improve again, and so obtain greater knowledge.

To the younger members of this institution who do not hold a chief's position, and to those just engaging in the profession of an engineer and surveyor, let me say, Never be afraid to ask questions relating to your profession, and whenever answered read up about the same thing. Do nothing in a slipshod manner; do not get into a rut, which the oftener you get into only goes deeper, but keep on fresh ground, and I have no hesitation in saying that when your chance comes you will be all the more fit to take the responsibility placed upon your shoulders.

I have received many courtesies at the hands of all the members of the Institution of Municipal Engineers with whom I have come in contact, and may I tender my thanks to those gentlemen who so kindly nominated and seconded my name for election? I have also to thank our secretary, Mr. Wyand, who has always been kindness itself, and no trouble has ever been too great so long as he can oblige, and I shall have more to say about him on my retirement at the end of my year of office.

I shall attend your council meetings as often as I can, and it is my intention, if my duties at home will allow, to attend at least once during my year of office a meeting in each of the various districts.

In conclusion may I again say how I feel the honour you have done me in electing me your president for this year, and I am sure my council and fellow citizens at Chester feel with me that an honour has been conferred upon them likewise?

I cannot conclude without making one further reference to the war into which this country has been drawn. We have many members of our institution not only at home in various capacities serving in His Majesty's Forces, but also at the Front, and I am sure it is the wish of the whole of the members of the Institution of Municipal Engineers that they may have a safe and early return to their native land.

A vote of thanks to the president for his address was passed on the motion of Mr. H. Boot, seconded by Mr. E. Whitwell, Aberystwyth.

In acknowledgment the President said he was rather sorry that it was not customary to discuss the presidential address. What he had said represented of course only his own opinions, and good sound criticism never did any harm.

NEW PRESIDENT'S CAREER.

Mr. W. Matthews Jones, city surveyor and engineer for the city and county borough of Chester, the new president of the Institution of Municipal Engineers, is a member of the Institution of Municipal and County Engineers. He is thirty-nine years of age, and was educated at the King's School and Technical Schools, Chester. On leaving school, his father, Mr. I. Matthews Jones, M.INST.C.E., F.S.I., had him articled co-jointly with Messrs. Douglas & Fordham, architects and surveyors, and himself. After completing his articles he was appointed as assistant in the city surveyor's office, Chester, and from this junior position he has risen to that of chief of this department in his native town.

Mr. Matthews Jones has had a very varied experience in municipal work and the following items selected from his career at Chester will be of interest at the present juncture. In connection with sewerage and drainage he has carried out to a cost [illegible], amounting to some £23,000, while he has supervised schemes on behalf of urban districts outside the Chester boundary (whose sewage is treated by Chester) to the amount of about £37,000. While acting as resident engineer to his council, he supervised tramway works carried out at an expenditure of £48,000, and to his [illegible] prepared and carried out extensions at a cost of £24,000. During the construction of the Chester sewage purification works, costing £70,000, he acted as resident engineer, and while deputy city engineer had full charge of the works for some two years after completion. He has now in preparation a town planning scheme for the city of Chester and outside districts, the area to be dealt with being 5,300 acres. In street widening and improvements he has executed works, including the purchase of property, to the value of £80,000. In an advisory capacity he has been responsible for many works, especially in connection with sewage disposal.

The following is extracted from the many testimonies to his abilities which have been given to him by his council: "Mr. Jones has carried out the duties connected with his office efficiently and well, being most diligent, painstaking and courteous, and possessing a high sense of duty . . . he is thoroughly conversant with the most scientific and up-to-date systems of road making, as our own roads testify . . . he is a man of pleasant bearing, courteous, a hard worker, and has had the management of large bodies of men, with whom he has always maintained a good relationship."

A portrait of Mr. Matthews Jones appears in the form of an inset to this issue.

COUNCIL MEETING.

At a meeting of the council held in London on November 25th the following applicants were recommended for admission:

To Membership: Mr. C. A. Howard, surveyor, Brigg Rural District Council; to Associate Membership: Messrs. J. L. Pelham, engineer's office, Hove, and J. W. Lloyd, assistant surveyor, Rushden Urban District Council.

New Members, &c. From the applicants recommended for admission at the last meeting three members were elected.

Public Health Acts (Building By-laws) Amendment Bill. The following resolution was passed unanimously: "That the council of the Institution of Municipal Engineers view with concern the proposed introduction of undue and unnecessary elasticity into the operation of building by-laws, and are in the strongest opposition to the Public Health Acts (Building By-laws) Amendment Bill. The erection of buildings in rural districts with any kind of material, and the possible extension of this concession to boroughs and urban districts, will in effect operate only to the detriment of the districts affected. The Memorandum to the Bill says: 'Above ground a man will be free to build as he likes, so long as he does nothing contrary to purposes of health,' and it is felt that these statements are in direct contradiction the one to the other. The only good point in the Bill is the discouragement of the crowding together of cottages, but this is provided for in existing Acts. The council foresee that if the Bill becomes law, the important and very necessary work of the building inspector in rural districts will practically cease."

Tenders for Sanitary Pipes.—A deputation from the Builders' Merchants' Alliance as regards uniformity of tender in the case of sanitary pipes was received, and after its withdrawal the council fully discussed the matter. A report will be prepared later.

Roll of Honour.—It was decided that a roll of honour embodying the names of members of the institution who serve their country during the war should be prepared, and the secretary will be pleased to have the necessary information.

Architects' Registration Bill.—The following members were elected to represent the institution at the forthcoming conference with the Society of Architects: Messrs. W. Matthews Jones, E. A. Stickland, E. Whitwell, H. J. Farmer, H. Hulse, W. L. Carr and D. C. Fidler.

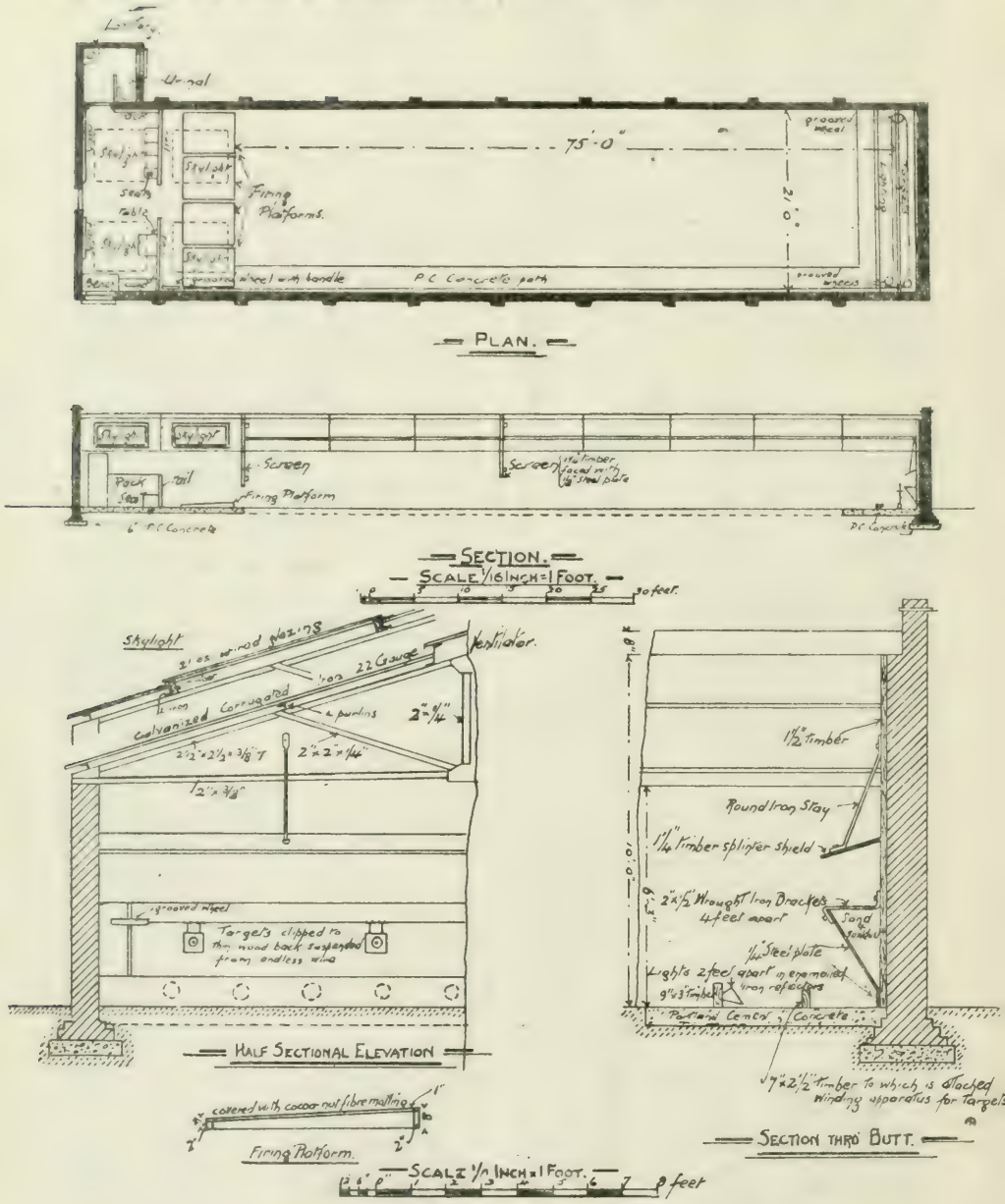
MINIATURE RIFLE RANGES.

By J. H. SEARE

[illegible]

[illegible] the firing end, which abuts on to a paved yard. These doors can be opened, forming a screen on each side, and the platforms brought back to the required distance. The butt shown is constructed at this range.

In open country the entire range need not be covered, but it must be fenced in. The butt is formed by an embankment faced with steel sheeting. The



DESIGN FOR MINIATURE RIFLE RANGE.

for a proposed range may be of service to those members of the municipal engineering profession who may be called upon to design such structures.

The drawing shows an entirely new building; but in a town there are usually buildings which can be altered at a little expense to meet the requirements of the authorities.

For instance, the Southwark United Miniature Rifle Club have converted an arch under the railway into a very efficient range. The length was not 25 yds., but this has been overcome by having folding doors firing end is protected by a covering, so that the range may be used in all weathers.

It is advisable, where land can be obtained, to have a range of at least 50 yds.

There are many accessories not absolutely necessary, but which add to utility, such as telescopes with adjustable stands, a mat on each firing platform, notice boards, a number over each platform, and so forth.

Artificial lighting will also be required for an indoor range.

The Surveyor

And Municipal and County Engineer.

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PRO PATRIA.

THIRTEENTH LIST.

We present herewith the thirteenth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Alexander, A., surveyor's assistant, Kendal Corporation, 4th Battalion, the Border Regiment (Territorials), on foreign service.

Armstrong, F. W., cashier, Kendal Corporation, 8th Battalion, the Border Regiment.

Beasley, A., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Carr, W. G., borough engineer's department, Southwark, 4th Battalion, Seaforth Highlanders.

Chaplin, Percy, turncock inspector, water department, Harrogate, Royal Field Artillery.

Chittenden, J., tractor driver's mate, county surveyor's department, Kent County Council, Army Service Corps.

Coleman, H., tractor driver's mate, county surveyor's department, Kent County Council, Royal Field Artillery.

Cooper, G., assistant surveyor, South Westmorland Rural District Council, Westmorland and Cumberland Yeomanry.

Davy, Gaius, assistant surveyor, county surveyor's department, Kent County Council, University and Public School Corps.

Durkin, Francis, ASSOC.M.INST.C.E., borough engineer's department, West Hartlepool, Second Lieutenant, Royal Garrison Artillery.

Fairbourn, A. N., surveyor's assistant, Kendal Corporation, 2nd Lieutenant, 8th Battalion, East Yorkshire Regiment.

Fitch, L., pupil to the borough surveyor, Sutton Coldfield, 17th Lancers.

Gent, Sergt.-Major, town clerk's office, Sutton Coldfield, has rejoined the Army as instructor.

Gunson, A., head clerk, borough treasurer's department, Kendal Corporation, 4th Battalion, the Border Regiment (Territorials), on foreign service.

Haigh, John F., assistant to Mr. W. A. H. Clarry, borough surveyor, Sutton Coldfield, enlisted in the Birmingham City Battalion, and since received a commission in the Worcestershire Regiment.

Hawkens, E., tractor driver's mate, county surveyor's department, Kent County Council, Royal West Kents, Territorials.

Howden, A., engine driver at sewage works, Epsom Rural District Council.

Jackson, Edward B., pupil, engineer's department, Ulverston Rural District Council, 4th Batt. King's Own Regiment, B Company.

Jacobi, J., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Jennings, Henry, assistant sanitary inspector, South Westmorland Rural District Council, Westmorland and Cumberland Yeomanry.

King, Gilbert R., surveyor's department, Twickenham Urban District Council, National Reserve.

Lancaster, S., roller driver's mate, county surveyor's department, Kent County Council, R.A.M.C.

Leddra, J., cleansing department, St. Ives (Cornwall), R.N. Reserve.

Lloyd, W., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Maybourne, J., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Mitchell, R., borough engineer's department, West Hartlepool, Durham, R.G.A., Territorials.

Page, Reginald W. B., clerk, county surveyor's department, Kent County Council, 6th City of London Rifles.

Pearce, E. W., fitter, county surveyor's department, Kent County Council, Army Service Corps, Territorials.

Pettitt, F., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Pope, Wm., tractor driver, county surveyor's department, Kent County Council, Royal West Kents.

Proctor, J. E., rate collector, Kendal Corporation, 8th Battalion, the Border Regiment.

Relf, C., tractor driver's mate, county surveyor's department, Kent County Council, Army Service Corps, Territorials.

Richardson, John, driver chainman, water department, Harrogate, 5th West Yorkshire Regiment.

Roberts, Harry, clerk inspector, water department, Harrogate, sergeant, 10th West Yorks Regiment.

Smythe, C., roller driver's mate, county surveyor's department, Kent County Council, Royal West Kents.

Spicer, Leslie R., clerk, county surveyor's department, Kent County Council, 6th City of London Rifles.

Standen, E., chauffeur, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Stanley, O. G., surveyor and inspector to the Windlesham Urban District Council, Oxford and Bucks Light Infantry.

Stevens, R., road foreman, St. Ives (Cornwall), R.N. Reserve.

Tucker, W., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Tumber, E., roller driver's mate, county surveyor's department, Kent County Council, Army Ordnance Corps.

Webster, Thomas, borough engineer's department, West Hartlepool, R.A.M.C.

Willard, A., blacksmith's striker, county surveyor's department, Kent County Council, R.A.M.C., Territorials.

Williams, G., motor lorry driver, county surveyor's department, Kent County Council, Mechanical Transport, A.S.C.

Wilson, Fred., borough engineer's department, West Hartlepool, Royal Field Artillery.

Achorutes Purpurescens.—Mr. G. Bertram Kershaw, M.AM.SOC.C.E., writes: "I should be glad to correct an error which occurs in 'Some Notes on Achorutes Purpurescens,' printed in THE SURVEYOR of November 13th. Line 20, 'Antennæ, 5-jointed' should read 'Antennæ, 4-jointed.' The mistake arose through Roman figures being used in the MS. for the iv., the i being very indistinct. I am obliged to Mr. H. D. Bell for drawing my attention to this point."

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, A.SOC.M.INST.C.E.

All communications in regard to this page must be addressed to the Editor, St. Bride's House, 24, Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for November is divided between

Mr. R. HUMLER,
L. Mansfield-road,
Wallham Green, S.W.,

and

Mr. B. KNIGHT,
Council Offices
Hayes, Middlesex;

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

442. Building Materials. What are chemists' tiles, and how are they made?

443. Vectors.—What are vector quantities? Explain how they may be added together graphically.

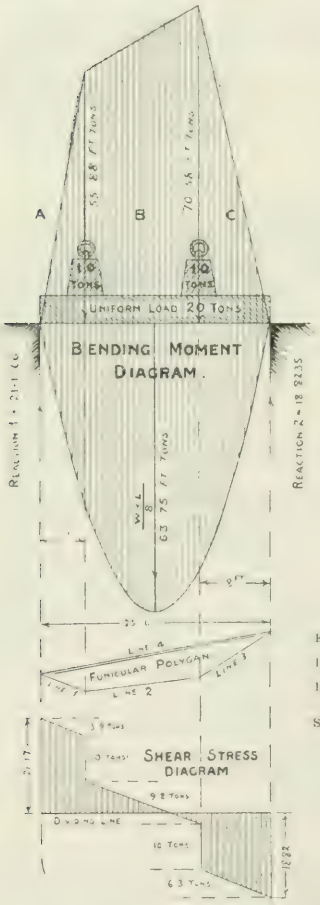
444. Strength of Shaft.—Find the relation between the stress on a twisted shaft and the moment producing it. Find the least diameter of a solid steel shaft to transmit 200-horse power at 150 revolutions per minute, the stress being limited to 9,000 lb. per square inch.

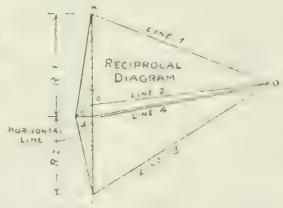
445. Cement Testing. Sketch and describe the apparatus necessary for conducting the bushel weight and specific gravity tests on Portland cement.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

440. Bending Moment.—A girder, 15 in. deep and 25 ft. 6 in. span, carries a uniform load of 20 tons, and in addition a load of 10 tons 5 ft. from the left abutment and a load of 10 tons 8 ft. from the right abutment. Draw the bending and shear diagrams. ("ARAX.")





SCALES.
Elevation—16 ft. = 1 in.
Line of loads — 10 tons = 1 in.
Bending moment diagram — 32 ft. tons = 1 in.
Shear stress diagram — 32 tons = 1 in.

The bending and shear diagrams are shown in the sketch, the method of constructing them being as follows: Draw the elevation of the beam to scale, showing the positions of the weights. The bending diagram can then be constructed, the portions due to the concentrated loads being drawn above the beam, and that due to the uniform load below the beam. The former should be constructed first. Set down the loads to scale, 10 tons and 10 tons, as shown on the reciprocal diagram. Draw lines 1, 2 and 3 to any point O, and transfer these lines to construct the funicular polygon, thus obtaining line 4. Transfer line 4 to the reciprocal diagram from O to D, which will give the reactions due to the concentrated loads AD = R'1 and DB = R'2. From D set off a horizontal line, equal to one division of the load line. In the illustration the horizontal line is made equal to two divisions which makes the scale of the bending moment half that of the load line. Join AE, BE and CE, and construct the diagram above the beam by drawing lines parallel to these three, as shown. The uniform load is calculated by formula $\frac{W \times L}{8}$ = greatest bending moment. This will be $\frac{20 \times 20{\cdot}5}{8}$ = 63·75 foot-tons. This should be set down from the centre of the beam to the same scale as the top half of the diagram. The lower portion is then found by constructing a parabola, as shown. Ordinates drawn from any point on the beam will give the bending moment at that point, the distance being scaled from top to bottom of the shaded portion, the width of the beam being neglected.

The shear stress diagram can be constructed as follows: First ascertain the reactions at each abutment—

$$\text{Reaction 1} = \frac{20}{2} + \frac{(10 \cdot 20{\cdot}5) + (10 \times 8)}{25{\cdot}5} = 21{\cdot}1766 \text{ tons}$$

$$\text{Reaction 2} = \frac{20}{2} + \frac{(10 \times 5) + (10 \times 17{\cdot}5)}{25{\cdot}5} = 18{\cdot}8235 \text{ tons}$$

Draw the dividing line as shown, and set up to scale on the left 21·1766 tons, and down on the right 18·8235 tons.

Lines should then be drawn from the points of application of the two concentrated loads, to cut the dividing line. The weight per foot-run of the uniform load is 20 ÷ 25·5 = ·784 of a ton. The dis-

place from the left abutment to the first weight is 5 ft. therefore 784 × 5 = 39 tons is the amount of shear at this point. There is then a shear of 19 tons due to the weight, and next 12 × 12 × 784 = 9 tons. The shear due to the second weight is 10 tons, and 8 ft × 784 = 6.3 tons is due to the remaining portion of the uniform load.

These amounts are set down, and the total shear diagram can then be drawn as shown.

The thickness or depth of the beam is not required for these calculations, unless it is required to find the stress in the flanges. For this divide the bending moment by the depth of the beam or girder.

The bending moments can be obtained both analytically or BM for concentrated loads at first weight.

About R1 = 11 1766 × [illegible] = [illegible] pounds
About R2 = 8 8235 × 20 = 10 × 12.5 = 55.88 tons

BM for concentrated loads at second weight.

About R1 = 11 1766 × 17.5 = 10 × 12.5 = 70.98 pounds
About R2 = 8 8235 × 8 = 70.58 pounds.

(P. H. *Middleton.*)

SOME RECENT PUBLICATIONS.*

Local Government, 1913-1914. By A. Macmorran, K.C., and K. M. Macmorran, M.A., LL.B. Price 21s. nett. London: Butterworth & Co., and Shaw & Sons.

This volume, which is the fifth of its kind, forms a compendium of local government law for the period from September 1, 1913, to September 1, 1914. The arrangement adopted in the earlier volumes has been adhered to, the several topics being dealt with in alphabetical order, and the information as regards each topic being divided into four parts—namely, statutes, orders, circulars and memoranda, digest of cases, and decisions of the Local Government Board. The names of the authors are so well known that it is hardly necessary to say that the information is absolutely reliable as regards accuracy, while the arrangement of the work, as detailed above, renders it an easy matter for the reader to turn up any desired reference. The value of such a work to the local government official cannot well be over-estimated, inasmuch as its possession ensures that he will have at hand the latest information in regard to the complex and ever-changing branches of the law which it is his duty to administer.

In directing the attention of municipal engineers to a work of this character, we would point out that many of the topics dealt with directly affect their work. Thus, separate sections are devoted to buildings, extraordinary traffic, highways and bridges, housing, private street works, refuse removal, sewers and sewage disposal, streets, town planning, and tramways. We select at random the section on housing as an example of the scope and character of the information afforded. In the first place the two Housing Acts passed upon the outbreak of war are set out in extenso. These are followed by two circulars sent out by the Local Government Board; a correspondence between the chairman of the Somerset County Council and the President of the Local Government Board in regard to the housing problem in rural districts; a long memorandum of the board regarding progress and activity under the Housing, Town Planning, &c., Act, 1909; a circular dealing with the Housing (No. 2) Act, 1914; a digest of five cases; and five decisions of the board on questions submitted to them by local authorities. Similar kinds of information are given in regard to no fewer than 103 topics. This work and its predecessors should certainly be in the office of every local authority.

Woodworking Machinery: Its Use, Progress and Construction. By M. Powis Bale, M.Inst.C.E., M.I.Mech.E. (Third Edition). Price 9s. London: Crosby Lockwood & Son.

In this work the author has combined the historical aspect of his subject with the practical. In the first part of the book, in addition to notes on design and construction, the names of the chief inventors and pioneers in woodworking machinery will be found, while the latter part is devoted entirely to practical and technical details. The fact that a third edition has been called for is sufficient proof of the appreciation in which the book is held, and the opportunity has been taken not only to make a thorough revision, but also to include in the text an account of the most modern kinds of machinery, improvements in constructional details, and a series of new illustrations which will be found to embody the most recent designs in wood working. The process of converting wood by machinery is comparatively new, having developed almost entirely during the past thirty years. The gigantic strides which have made in recent years, however, still leave plenty of scope for further progress, and Mr. Bale's comprehensive and practical account of the present position makes an opportune appearance. There are a number of excellent illustrations, and a good index which facilitates reference.

A copy of the sixth edition of the "Handbook for Farmers and Dairymen," by F. W. Woll, Professor of Animal Nutrition, University of California, has reached us from Messrs. Chapman & Hall. Valuable data scattered through American agricultural literature have been gathered in this handy little volume, and arranged in such a manner as to make them easily accessible and convenient for reference. The price of the work is 6s. 6d. nett.

Vol. viii. of "The Edinburgh Architectural Association Transactions," just issued, contains, in addition to accounts of the last three annual general meetings of that body, various interesting and instructive papers descriptive of places visited by the members from time to time in the period covered by the volume.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.
—Massinger: "The Fatal Dowry," Act ii., 2

SANITARY SECTIONS FOR THE FRONT.

To the Editor of The Surveyor.

Sir,—Your readers will be interested to hear that orders have just been received from the War Office to send out several sections of the Sanitary Companies for sanitary duties with the Expeditionary Force. These will absorb practically the whole of the Imperial Service Company and a half of 1st Reserve Company, rendering it necessary forthwith to recruit additional men to fill the vacancies and to furnish the further sections which will be sent to the front later on. These new sections will afford opportunities for promotion to non-commissioned rank to men with good sanitary qualifications.

A large number of your readers have already come forward in response to my previous appeals, and I trust that the prospect of foreign service, and the official recognition now received of the value of the Sanitary Companies will stimulate many more to do so.

Intending recruits should apply forthwith, either personally or by letter, to O.C. Depot, Medical Units, 2nd London Division, Duke of York's Headquarters, Chelsea, S.W.—Yours, &c.,

Arthur J. Martin,
Capt., R.A.M.C.T.,
O.C., 2nd (1st Reserve) London Sanitary Co.

Duke of York's Headquarters,
Chelsea, S.W.
December 1, 1914.

CONCRETE ROADS: TRIAL SECTIONS IN KENT.

To the Editor of The Surveyor.

Sir,—Will you kindly allow me slightly to amend the particulars respecting the above published in last week's issue of The Surveyor?

Sections Nos. 1 and 2.—The concrete is not to be reinforced, except the centre joints, for a width of 3 ft.

Section 2.—The surface of the concrete is to be dressed with tar and ¼-in. clean limestone chippings, and not 1¼-in. chippings, as reported by you.

Section 4b.—The British Reinforced Concrete Engineering Company's B.R.C. fabric is to be placed 4 in. from top surface of concrete, and not 2 in. as reported.

Longitudinal expansion joints are to be provided in all the sections, and transverse expansion joints

[illegible]

[illegible]

[illegible]

[illegible] H. T. Chapman.

[illegible]

Maidstone.

[illegible] 2, 1914.

PAYMENT BY COMMISSION.

To the Editor of The Surveyor.

Sir,—I [illegible] p. 635 [illegible] payment [illegible] £200.

I should have thought it was hardly necessary to [illegible] work is contrary to law, and will render the official liable to dismissal and to be for ever after ineligible to hold office under a public authority. There is no doubt that the Local Government Board auditor on first seeing the entry of such a payment would raise the question.

The [illegible] *Bardsley*, 1888, 21 Q.B.D., 544; 52 J.P., 595.

The orthodox way of receiving payment for work [illegible] a resolution to be passed by the local authority increasing the official's wages for one month by the sum of £[illegible], and no mention whatever must be made of payment by commission.—Yours, &c.,

H. Gilbert Whyatt, M.Inst.C.E.

Borough Engineer's Office,
170 Victoria-street,
Grimsby.
December 1, 1914.

AN AUSTRALIAN CITY'S GIFT.

To the Editor of The Surveyor.

Sir,—It may be of interest to your readers to know that the council of this city has, among other donations, handed over, as a free gift to the Commonwealth Government, the whole of its motor traction service, comprising two 5-ton vehicles and one 3-ton vehicle, representing a value of some £2,500.

These motors are going to the Front with the First Australian Expeditionary Force in company with over 100 similar vehicles.—Yours, &c.,

E. F. Gilchrist,
City Surveyor.

Town Hall,
Prahran.
October 14, 1914.

Water for Roadmaking.—In his report for the twelve months ended March 31st last, Mr. E. F. Spurrell, borough engineer of Holborn, mentions that during the period in question the matter of the supply of water for road making purposes was considered by the council, who agreed that payment should be made to the Metropolitan Water Board of 3s. per mile per annum on the total mileage of streets in the borough in addition to the usual charge of 6d. per 1,000 gallons for water used. Under this arrangement the council have power to draw water from any of the water posts in the borough for paving purposes, thus avoiding the necessity of measuring up each repair work carried out and paying for it under the Water Board's schedule.

A Forthcoming Meeting.—The programme of the meeting of the North-Western and Northern Districts of the Institution of Municipal Engineers which is to be held at Manchester and Salford on Saturday, the 12st inst., has now been issued, and is as follows: 1.30 p.m., assemble at Mitre Hotel, Manchester; 2.30 p.m., arrive at Salford Corporation flag-making works; 3.30 p.m., leave the works; 3.45 p.m. arrive at Salford Corporation electricity works; 5 p.m., leave the works; 5.15 p.m. arrive at Salford Town Hall; 5.30 p.m., tea at the town hall, at the kind invitation of the Mayor of Salford and the respective committees whose departments are to be visited; 6.30 p.m., social in Mayor's Chamber, Salford Town Hall. Owing to the war and the commandeering of motor chars-à-banc, taxi-cabs have had to be engaged. The cost for the day's journey to the various works will be 2s. 6d. per head.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not rather remarkable that in a recent issue of *Scientific American* there should have appeared, under the heading "Are Good Roads on Bridges Impossible?" a letter in which the writer, Mr. Albert F. Shore, of New York, deplores the fact that the paving of American bridges is so bad as to be almost impassable? What can be wrong with these bridges that their paving should be so bad? And would it not be well if the engineers responsible for this paving could inspect some of our bridges, especially the Tower Bridge, and thus learn how the carriageways of such structures should be paved?

* * * *

Will not all road makers be interested in the results of the experimental reinforced-concrete roads which are being constructed on the Dover road in Kent by Mr. Chapman, the county surveyor? Is it not a fact that if concrete can be so constructed as to make a permanent carriageway capable of carrying all descriptions of traffic without noise and without abrasion or dust, such a construction has many advantages over many other forms of construction?

* * * *

Are we not all a little astonished at the result of the Horseshoe Competition which was organised by the Roads Improvement Association? Did not some of us hope that out of the 800 shoes submitted in competition there would be at least one shoe of such paramount excellence that it would have revolutionised horse traffic, and not only have merited the 100 guineas premium, but have commanded the horseshoe market of the world? Is it not a little disappointing to find that nothing very new or startling was submitted in competition, and that the awards are given to horseshoes that are already on the market?

* * * *

Is not Mr. J. D. Watson, of Birmingham, to be congratulated on the steps he is taking to prevent the creation of a standard of purity applicable to all sewage effluents? Would not such a Parliamentary standard be impossible of application, and would not the attempt to enforce it lead to almost endless litigation?

* * * *

Does not all the correspondence which has been going on lately with reference to the training of the municipal engineer lead one to the inevitable conclusion that success or not in after life depends on the young man himself rather than upon the engineer to whom he may chance to be articled? Is it not a well-known fact that the personal equation is bound to upset the most carefully devised theories and calculations?

* * * *

"By-laws" is a term which is a veritable household word to civic engineers. Couldn't they, therefore, agree how to spell it? Some authorities have it as above, others as "bye-laws." Surely the former is correct. Among the Angles the unit group or community was a "township," corresponding to our parish. The men of the township met generally at some conspicuous natural object, such as a big stone or tree, and there they made their local rules of governance. A township was a *by*; hence the laws of the township are *by*-laws. Q.E.D.

John Burns, Hon.M.Inst.C.E.—Mr. John Burns was on Tuesday last elected an honorary member of the Institution of Civil Engineers.

Mexphalte Grouted Roads.—The Anglo-Mexican Petroleum Products Company, Limited, write: "The military activities of the last four months, necessitating heavy traffic over the roads of the country, have subjected the highways to a strain of a very severe character, and one likely to help in determining the relative efficiency of the various systems employed. In this connection the report of our representative on a road grouted with Mexphalte is of interest. In this he says: 'I have been over to Wetherby this afternoon, and seen the road I grouted when the surveyors visited us some time ago. It is a most excellent road with a perfect surface. Although there has been a lot of very heavy traffic over it in the shape of heavy guns . . . these have not left a single mark on the road so far as I could see, although they have damaged the tar-macadam.'"

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Aberavon T.C. (December 1st. Mr. W. M. Cross). £667 for street improvements, £336 for new works of water supply, and £6,915 for a proposed new recreation ground and playing field at the Jersey Beach, Aberavon.—The town clerk, Mr. E. Tennant, stated that the freehold site for the new recreation ground, consisting of 8 acres, had been presented to the corporation by the Earl of Jersey. The Local Government Board had already provisionally sanctioned the carrying out of the work of the recreation ground so as to enable the council to provide work for those men thrown out of employment through the war, and had also made a promise of a grant towards the cost.

Birmingham T.C. (November 30th. Mr. R. H. Bicknell).—£19,262 for the erection of public baths in George Arthur-road, Saltley.—It was stated that the freehold of this site had been given as a gift by Lord Norton, and that the council had already sunk a borehole and satisfied themselves there was a supply of water available.

Bolton T.C. (November 24th. Mr. F. H. Tulloch). £22,495 for widening Halliwell-lane and Plodder-lane, and £6,100 for the construction of a new road from Church-road to Chorley Old-road.—The borough engineer, Mr. E. L. Morgan, submitted the details of the proposed works. The new road, he stated, would have a length of 333 yds. and a width of 42 ft. It was expected that the schemes would find employment for 120 men for a period of nine months.

Chailey R.D.C. (December 1st. Mr. R. G. Hetherington).—£5,720 for sewerage and sewage disposal works at Plumpton.—The engineering details were explained by Mr. H. Bertram Nicholls, and Mr. H. Weller, sanitary inspector, also gave evidence. It is proposed by the scheme to sewer from the top of Plumpton-lane, in the north, to Plumpton Cross, in the south, with the outfall site in East Chiltington.

Knaresborough U.D.C. (November 18th. Mr. P. M. Crosthwaite). £1,500 for the provision of a recreation ground at Stockdale-walk, and £365 for sewerage works at Stockwell-lane and Bondend.—It appeared from the statement of the surveyor, Mr. E. Prest, that a portion of the sewerage works had already been carried out. The larger portion remaining was in connection with the sewerage at High Bondend, which it was proposed to take through Kirkham Hall estate, to include practically all High Bondend.

Stoke-on-Trent T.C. (November 26th. Mr. H. R. Hooper).—£44,600 for the purposes of the electricity undertaking.—The amount it is proposed to borrow includes £8,000 for the lighting of Fenton, £2,800 for supplying power to the Goldendale district and £14,000 which has been overspent on the new central power scheme. The board had sanctioned an expenditure of £51,000 on this scheme and £65,000 had been spent, leaving a deficit of £14,000.

APPLICATIONS FOR LOANS.

Arlecdon and Frizington U.D.C.—£3,500 for the purposes of the gasworks.

Bournemouth T.C.—£7,800 for wood paving.

Cheadle R.D.C. £2,000 for the purchase of a sewage farm.

Cockermouth R.D.C. £2,400 for works of sewerage.

Colne T.C. £5,080 for laying out Judge Fields.

Croydon T.C. £30,000 for hospital extension.

Hammersmith B.C.—£10,000 in respect of the electricity undertaking.

Hendon U.D.C.—£10,002 for the Hale-grove school.

Liversedge U.D.C.—£1,216 for laying out the market site, and £1,561 for street works.

Mansfield T.C.—£1,300 for works of sewerage.

Marylebone B.C.—£3,697, balance of the cost of the new town hall site.

Preston T.C.—£12,000 for repaving works.

Salford T.C.—£27,414 for a tuberculosis hospital.

Saxmundham U.D.C. £363 for the purchase and adaption of premises as a fire station.

Settle R.D.C. £3,300 for works of water supply.

Southampton T.C.—£1,700 for road widening and improvement.

Stone U.D.C.—£3,764 for works of water supply.

Twickenham U.D.C.—£450 for the extension of the fire station.

Ulverston U.D.C.—£10,000 for gas mains, slot meters, and cookers.

Walthamstow U.D.C. £6,507 for the purposes of the sanatorium.

Wrexham T.C.—£1,323 for sewerage and storm-water drainage.

LOANS SANCTIONED.

Barking U.D.C.—£5,220 for road widening.

Barmouth U.D.C.—£2,300 for the purchase of Cellfechan Farm.

Hebden Bridge U.D.C.—£3,500 for works of sewage disposal.

Honley U.D.C.—£1,065 for widening Honley bridge.

Isle of Wight R.D.C. £33,000 for main road improvement.

Maidstone T.C.—£1,350 for extensions at the electricity works.

Middlesex C.C.—£875 for the purchase of a site at Hanwell for a school.

Rowley Regis U.D.C.—£820 for road improvement.

Sheringham U.D.C. — £900 for surface-water drainage.

Tamworth T.C.—£700 for ferro-concrete bridges and fencing; £590 for river walls, and £110 for the purposes of the recreation ground.

Torquay T.C.—£15,860 for the electricity undertaking.

Warrington T.C.—£8,291 for the erection of a school.

Westbourne R.D.C. £1,700 for a water supply.

FORTHCOMING INQUIRIES.

DECEMBER.	£
8.—**Crick.** For the provision of workmen's houses (Mr. Courtenay Clifton)	1,200
8.—**Dunmow.** For the provision of workmen's houses (Mr. H. S. Stewart) ...	650
8.—**Nelson.** For street works and the provision of public conveniences (Mr. F. H. Tulloch)	6,645
8.—**Oakengates.** For the purposes of sewerage extension (Major J. Stewart)	1,045
8.—**Yarmouth.** For cemetery extension (Mr. R. H. Bicknell)	800
9.—**Altrincham.** For the provision of electric street lighting (Mr. H. R. Hooper)	675
9.—**Clacton.** For the provision of a band stand (Mr. R. H. Bicknell)	5,094
9.—**Leek.** For laying out a park (Mr. M. K. North)	3,660
9.—**Wednesbury.** For the purposes of the electricity undertaking (Major J. Stewart)	2,146
9.—**Wigan.** For works of paving (Mr. F. H. Tulloch)	11,881
10.—**Barnsley.** For park extension (Mr. M. K. North)	
10.—**Wells-next-the-Sea.** For the provision of workmen's houses (Mr. Courtenay Clifton)	3,850
10.—**Widnes.** For the erection of a public convenience (Mr. F. H. Tulloch) ...	300
11.—**Blackpool.** For electricity and cemetery purposes (Mr. H. R. Hooper)	8,662
11.—**Marple.** For works of sewerage (Mr. F. H. Tulloch)	1,150
14.—**Watford.** For the erection of workmen's houses (Mr. Courtenay Clifton)	20,252

Victoria-street Tramway.—Westminster City Council having given notice of opposition to the proposal of the London County Council to seek Parliamentary powers for the construction of tramways from Victoria to Westminster Bridge by way of Victoria-street, the Law and Parliamentary Committee of the City Council report that the London County Council has decided not to proceed with the contemplated legislation.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important proposals, details of which appear below: Building—Darwen, Lytham, housing and town planning—Doncaster, Leeds, Walthamstow; roads and materials—Farnworth, Manchester, Preston; sewerage and sewage disposal—Beverley, Crediton; water, gas and electricity—Ashington, Chard, Coventry, Sligo. Particulars of other works projected will be found in our Local Government Board Inquiries, etc.

BUILDINGS.

Darwen T.C.—Tenders are to be obtained for new public baths, to be erected on the site of the Peel baths.

Deal T.C.—A public convenience is to be erected at a cost of £125.

Dundee T.C.—The city engineer, Mr. James Thomson, has prepared plans for new municipal buildings, which are estimated to cost £350,000.

Hereford R.D.C.—A scheme is under consideration for the extension of the isolation hospital, at an estimated cost of £3,573.

Lytham U.D.C.—It has been decided to construct a marine lake and open-air baths on the foreshore, and an area of about 20 acres has been acquired for the purpose from the Clifton estate. The estimated cost of the scheme is £16,000. The council have also virtually decided to purchase baths and assembly rooms on the beach, on the site of which it is intended to erect a large concert hall and baths.

Retford T.C.—The council have adopted a scheme for a joint isolation hospital.

Shipley U.D.C.—It has been agreed to construct an underground public convenience at an estimated cost of £670.

Staines R.D.C.—It has been resolved to prepare plans for a small-pox hospital in High Tree-lane.

Teignmouth U.D.C.—The council have considered the steps to be taken in connection with the proposal to provide a combined small-pox hospital for the district, and a sub-committee has been appointed to confer with the councils of neighbouring towns on the subject, the principle being approved of the expenses of the retaining and purchase of a tent hospital being based upon the population.

Torquay T.C.—It was reported at the council meeting on Tuesday that the provision of steam for pumping and heating the water for the swimming and medical baths would entail an extra expenditure for a new boiler and alterations of £250.

Wallsend T.C.—The tender of Messrs. R. & S. Tait, of Seaton Delaval, has been accepted for extensions at the hospital.

HOUSING AND TOWN PLANNING.

Ampthill U.D.C.—A committee has been appointed to report upon a housing scheme, the Duke of Bedford having offered land for the purpose at the Government valuation.

Bideford T.C.—The borough surveyor, Mr. R. E. L. Hookway, has received instructions to prepare plans and specifications for a block of twenty workmen's cottages.

Doncaster T.C.—The sanction of the Local Government Board has been received to a scheme for the erection of 102 workmen's houses at Carr House and Elmfield.

Dublin T.C.—The council are considering a scheme for the erection of forty-two workmen's dwellings in the Boyne-street area.

Helston R.D.C.—Plans are being prepared for the erection of six workmen's dwellings at Mullion and Coverack.

Leeds T.C.—The Development Committee have adopted a scheme for the erection of forty-eight workmen's dwellings on the Ivy House estate, York-road, at an estimated cost of £9,953.

Liverpool T.C.—It has been agreed to make application to the Local Government Board for permission to appropriate the Gilbrook estate, in the north end, and a site adjoining the proposed site for south end baths off Old Chester-road, Rock Ferry, for the erection of working-class houses.

Tottenham U.D.C.—The engineer, Mr. W. H. Prescott, has received instructions to prepare a scheme for erecting houses on the council's land at Lottenham Hale.

Wallsend T.C.—It was intimated at the council meeting on Tuesday last that sanction had been granted to the application for a town planning scheme for a part of the borough.

Walthamstow U.D.C.—A scheme has been approved for building eighty workmen's dwellings, at an estimated cost of £20,000.

Watford R.D.C.—The council have approved the plans and specifications prepared by Mr. Breeds for the erection of ten cottages at Cobden-hill, Radlett.

PARKS AND OPEN SPACES.

Edinburgh T.C.—The Public Parks Committee of the council have generally approved a proposal to purchase Corstorphine Hill on behalf of the public.

Mansfield T.C.—The borough surveyor, Mr. T. P. Collinge, has been instructed to prepare plans for laying out part of the recreation ground for cricket, including the building of a pavilion.

ROADS AND MATERIALS.

Acton U.D.C.—It has been agreed to make up the back passages of Elm Park-gardens, Cecil-road, and Valetta-road.

Barking U.D.C.—A scheme, estimated to cost £8,470, has been adopted for road widening at the corner of East-street.

Battle U.D.C.—A letter has been received from the county council, stating that they would contribute to the cost of tarring the roads, whether the roads were broken up within twelve months or not. Previously they had decided that they would not contribute if the roads were broken up within a year.

Camberwell B.C.—The council have received an intimation from the London County Council of their intention to undertake the widening of Rye-lane at the junction of High-street, Peckham, at an estimated cost of £1,750, the borough council having agreed to do the necessary paving works.

Carnarvonshire C.C.—The Surveyor's Committee have several schemes of road improvement under consideration, and meanwhile work is proceeding upon the widening of Balaculyn road and repairs to the Clynnog road.

Crompton U.D.C.—Estimates are to be prepared for paving Beal-lane with granite setts, or, alternatively, with redressed setts.

Diss U.D.C.—The tender of the British Gas Light Company, at 3⅞d. per gallon, has been accepted for the supply of 9,000 gallons of tar.—It has been resolved to put down Tarvia in St. Nicholas-street, Market-place, and Victoria-road.

Dudley T.C.—The Public Works Committee recommend that the widening of Downing-street and the continuation to Ednam-road be carried out, the corporation to divert the northern intercepting sewer to the line of the new street and pay Lord Dudley £914 as compensation for the land given up in Downing-street and for the loss of buildings in Downing-street and Tower-street. In consideration of this Lord Dudley is to construct the new road at his own cost, the work to be completed in two years.

East Grinstead R.D.C.—It has been agreed to carry out the improvement in the road between Summersales Hill and Withyham, and to make application to the Road Board for a grant towards the cost.

Egham U.D.C.—The council have accepted the proposal of the governors of Stroud School to construct a road at Egham-causeway, provided the council are guaranteed against any loss in the matter.

Ely U.D.C.—The surveyor, Mr. W. McKelvie, has submitted an estimate of the proposed improvement in the New Barnes-road amounting to £275.

Enfield U.D.C.—The surveyor, Mr. R. Collins, has been instructed to prepare plans for making up two roads.

Fleetwood U.D.C. Consideration is being given to a scheme prepared by the surveyor, Mr. E. Fletcher, for improvements on the foreshore, which are estimated to cost £10,000.

Godstone R.D.C.—The highways surveyor, Mr. G. E. Crowter, recently submitted a plan of the suggested improvements from the London and Lewes main road to Godstone Green and stated that the scheme had been submitted to the county council. The total cost was estimated at £1,289, of which the county council might make a contribution of £350. The council agreed that an application should be made to the Road Board for a grant towards the cost, and for a free loan.

Hebden Bridge U.D.C.—Conditional upon a grant being received from the county council, it has been agreed to carry out a scheme of kerbing, channelling and paving.

Lancaster T.C. It is intended to carry out a road widening scheme at an estimated cost of £3,200.

Leyburn R.D.C.—The Road Board have promised to make a contribution of £36 towards the cost (£100) of widening and straightening the main road from Leyburn to Richmond.

Maidstone T.C.—It is proposed to lay wood blocks in King-street at an estimated cost of £1,600.

Manchester T.C.—The plans of the new road which is to commence near Levenshulme and extend to Schools Hill, Cheadle, provide for a width of 80 ft., but a proposal has now been made that the road should be 120 ft. in width. At a meeting of the Town Planning Committee details of the scheme were considered. Several of the leading officials of the tramways department attended, but no decision was arrived at. It is understood that the Tramways Committee will consider the proposed extension from the point of view of the future use of the road for a tramway track.

Norfolk C.C.—The county surveyor, Mr. T. H. B. Heslop, submitted to the Eastern Highways Committee recently a report on the damage caused to main roads especially by motor traffic. There had been great difficulty in repairing holes and trenches without putting a fresh coating of material over the whole of the middle of the road. He had been looking about for some cheap appliance by which this mischief could be repaired economically with tar material. He had come across a little tar-boiler which answered the purpose admirably, and had been used extensively in other counties. Twenty-five of them were in use in Hertfordshire, and were highly spoken of. They cost £6 6s. each. If Norfolk bought twelve of them—seven for the eastern division and five for the western—they could be had for £6 each. He wished to be allowed to buy seven for the eastern division. The money would come out of contingencies. The committee agreed to this request.

Orsett R.D.C.—It has been agreed to improve the road from Tilbury Fort to the main Southend road, at an estimated cost of £4,034, towards which the Road Board have sanctioned a contribution of £2,943.

Panteg U.D.C.—The council have adopted the plans of the surveyor, Mr. H. R. Davies, for works of repair in Woodfield-road and Springfield-terrace.

Preston T.C.—A decision has been reached to carry out the repaving of certain streets at an estimated cost of £12,700, in the event of distress becoming acute owing to the war.

Salford T.C.—The council have decided to purchase property in Whit-lane, Pendleton, for £4,225, for the purpose of a widening scheme, and information has now been received that the Local Government Board have sanctioned the borrowing of the money without holding an inquiry.

Sunbury U.D.C. The Road Board have notified to the council their consent to grant £922 towards the cost of resurfacing with Tarmac the Kingston and Staines road, the total involved being £2,767.

Uckfield R.D.C.—The surveyor, Mr. E. W. Ray-Johnson, reported lately that he had received an application to carry out work on some more roads in the Crowborough Warren for the War Office. The estimates went through the Road Board three weeks ago, and they were still at the War Office. He understood they had been approved. The Engineers of the second army wanted the work done at once, and wished him (Mr. Ray-Johnson) to do it. The council agreed to allow the surveyor to carry out the work after the agreement had been signed.

Wells T.C. The city surveyor, Mr. C. Parsey, reported recently that the tar-spraying of roads carried out in the city was as follows: Main roads, 44,210 sq. yds.; district roads, 30,714 sq. yds.; total, 74,924 sq. yds. The total cost was £250 19s. 3d., or ·8d. per square yard. This cost included all repairs to the sprayer, and all costs incidental to the work. Alderman Richards said this was very satisfactory, and the cost was much less than previously. The mayor said that the city surveyor had reduced the cost by about 70 per cent.

SEWERAGE AND SEWAGE DISPOSAL.

Birmingham T.C. The Public Works Committee on Tuesday last obtained the sanction of the council to sewerage schemes for Adcock's Green and Erdington, the expenditure involved being £8,560.

Coatbridge T.C.—Sewerage extensions are to be carried out at an estimated cost of £1,100.

Crediton U.D.C.—The Local Government Board have written to the council stating that the board are unable to assent to postponement of the Fordton pumping scheme in connection with the sewerage undertaking, the carrying out of which the loan for the purchase of Lord's Meadow was sanctioned.

Croydon T.C.—The corporation have decided to carry out sewerage works and surface-water drainage, at an estimated cost of £950.

Manchester T.C.—The council on Wednesday last agreed to take over the Stockport Corporation sewage works and lands adjoining, having an area of over 94 acres, and to connect the works with the city system of sewerage.

Seisdon R.D.C.—The new sewage outfall works at Autherley, which were formally inspected by the members of the council last week, were designed and constructed by Mr. W. Cannan, district surveyor and engineer, with direct labour, to deal mainly with the sewage from the Aldersley-lane, Sandy-lane, and Codsall-road area of the Wrottesley parish. The members of the council expressed to Mr. Cannan their satisfaction with the design, construction and working of the plant.

WATER, GAS, AND ELECTRICITY.

Ashington U.D.C. A decision has been reached to apply to Parliament for power to provide a water supply, at an estimated cost of between £60,000 and £70,000.

Chard T.C.—Consequent upon a letter from the Local Government Board pointing out that the question of the water supply had been under the consideration of the council for many years, it was decided on Tuesday last to call a special meeting to reconsider the recent decision to defer the construction of waterworks.

Coventry T.C.—The council on Tuesday last sanctioned an expenditure of £55,897 for new plant at the electricity works.

Dalbeattie T.C.—A scheme has been approved for the extension of the reservoir, at an estimated cost of £900.

Lurgan U.D.C.—A resolution has been passed to apply in the next Session of Parliament for authority to purchase the undertaking of the Lurgan Gas Light and Chemical Company.

Market Harborough R.D.C.—It is proposed to carry out a water supply scheme for Fleckney.

Skipton R.D.C.—The council have approved the scheme of the surveyor, Mr. A. Rodwell, for a water supply for Ingleton, at an estimated cost of £3,400.

Wootton Bassett R.D.C.—Expert advice is to be obtained with a view to providing a proper water supply for Ravenhill.

MISCELLANEOUS.

Derry T.C. The city surveyor has submitted a report on possible relief works, in which he recommended (1) the laying of a sewer in Strand-road from the foot of Duncreggan-road to the Rock-road; estimated cost, £160, of which about £130 would be spent in wages. (2) The construction of a high-level inter-

replacing sewer from the foot of Cleggan road along the Lone Moor road and through the G.N.R. line to the river; this would prevent flooding from rainfall; estimated cost £2,000, of which £1,100 would be expended in labour. (b) The construction of a filter bed at Farnley Tyas for the Burnsbagh water to pass through, and improving the reservoir; estimated cost, £350, £200 being for wages. (d) The rebuilding of part of the cemetery wall on the Lone Moor road; estimated cost, £350, of which £200 would be in wages. This report has been forwarded to the Relief Committee to ascertain what grants could be obtained for the purpose of carrying out these works.

Huddersfield T.C.—It is the intention of the council to extend the tramways to Brighouse, *viâ* Rastrick, in order to link up the Huddersfield system with the Halifax and Bradford tramways.

PERSONAL.

Mr. William Hemity has been appointed borough surveyor of Burnley at a salary of £150 a year.

Mr. R. P. Pearce, surveyor and inspector to the Meltham Urban District Council, has had his salary increased by £25 a year.

Mr. W. Smith, of Monmouth, was on Tuesday last appointed borough surveyor and inspector of Monmouth at a salary of £130.

Mr. A. S. Lilley, surveyor to the St. Helens (Isle of Wight) Urban District Council, has been appointed waterworks engineer to the Portland Urban District Council.

Mr. Percy G. Cocks, second assistant engineer to the Wandsworth Borough Council, has been appointed surveyor to the St. Helens (Isle of Wight) Urban District Council.

Mr. Nicol, road surveyor to the Garioch District Committee of the Aberdeenshire County Council, has had his salary increased by £20 a year, with additions of £10 annually until £200 is reached.

Mr. G. A. Ballard, ASSOC.M.INST.C.E., assistant borough engineer of Guildford, has received an honorarium of £20 in acknowledgment of the services performed by him during the four months pending the appointment of a borough engineer.

Mr. George Gledhill, late surveyor to the Balby-with-Hexthorpe Urban District Council, was on Wednesday last offered the position of assistant borough surveyor of Doncaster, with charge of highways and sewers. Balby is now incorporated in the Doncaster municipal area.

Mr. Henry Card, formerly county surveyor of East Sussex, died, we regret to state, on November 27th, at the advanced age of ninety-six. The funeral, which took place on Tuesday at Lewes, was attended, among many others, by Mr. F. J. Wood, the present county surveyor of East Sussex.

Mr. G. Bertram Kershaw, M.AM.SOC.C.E., has been elected a member of the Institution of Civil Engineers. Messrs. N. S. Bowes, council offices, Sale, Manchester, A. T. Hobbs, city engineer's department, Birmingham, and W. H. Thompson, municipal offices, Kilburn, N.W., have been elected associate members, and Messrs. L. G. H. Major, resident engineer's office, Suva drainage works, Suva, Fiji, and A. D. Wright, council offices, Prestwich, Manchester, have been admitted as students of the same body.

The Nottingham Port Scheme.—In view of the fact that practically no unemployment exists at Nottingham, and no undue amount is probable, the Government has withdrawn its offer of £50,000 towards the cost of deepening the river Trent between Nottingham and Newark, in order to make Nottingham an inland port. The city council has, notwithstanding, decided to proceed with the scheme.

A Housing Scheme at Newcastle.—At the meeting of the Newcastle City Council on Wednesday, the Housing Committee brought forward a scheme for developing 16¼ acres of the city's Walker estate by erecting 400 houses of various types, each with a garden, at a cost of £67,000, the rents being from 4s. 3d. to 7s. 6d. It was stated that there was absolutely a famine in such houses. The principle of the scheme was approved, but it was referred back on questions of detail.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ABERTILLERY URBAN DISTRICT COUNCIL.

TEMPORARY ASSISTANT SURVEYOR AND DRAUGHTSMAN

Wanted, temporarily, as Assistant Surveyor and Draughtsman in the Surveyor's Department. The person appointed must be a rapid draughtsman and accurate surveyor and leveller, with previous experience in a Municipal Office. Wages, £2 5s. per week. Providing his services are satisfactory, he will be engaged until the return of the present assistant, who is on Active Service.

Applications, endorsed "Assistant Surveyor," stating age, qualifications and previous experience, accompanied by copies of three recent testimonials, must reach me not later than Wednesday, 16th December, 1914.

LIONEL D. LEWIS,
(2,141) Engineer and Surveyor.

WANTED, by an Engineer and Surveyor to a town in the Midland, a thoroughly competent man to survey and bring up to date the Ordnance Sheets. Applicants should be competent to lay down minor triangulations, and be neat draughtsmen, and expeditious in their work.

Wages, 45s. per week. To a suitable man the duration of the work will not be less than 12 months. Full particulars, in own handwriting, stating age, &c., to Box 1,492, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,142)

A BOROUGH ENGINEER (N.R., Yorks) has a vacancy for young gentleman as pupil.—Box 1,490, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,140)

WANTED, Surveying Assistant (temporary) for a Lancashire Borough Surveyor's Office; fully qualified; one with municipal experience preferred. Salary, £2 per week. Address, with copies of three recent testimonials, Box 1,493, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,143)

REFUSE DESTRUCTOR.

The time for receipt of Proposals by the Municipal Commissioner for the City of Bombay has been extended to the 7th March, 1915, for the complete Manufacture, Erection and Equipment of a Refuse Destructor within the City for the incineration of 200 tons of refuse per day.

A copy of the Particulars and General Conditions for Tenderers, and Plan of the proposed Site, can be obtained on payment of five shillings, which will not be returned, from Messrs. Henry S. King & Co., 65 Cornhill, London, who will also give inspection of the Schedule of Rates for Materials and Labour prevailing in Bombay.

P. R. CADELL,
Municipal Commissioner for the City of Bombay.

Municipal Office,
Bombay, India. (2,144)

REIGATE BOARD OF GUARDIANS.

SUPPLY OF GRANITE OR BASALT SPALLS.

Tenders are invited for the Supply of 50 tons of Granite or Basalt Spalls, for breaking, delivered, carriage paid, at the Guardians' Institution, near Earlswood Station (L.B.S.C.R.).

Persons tendering must state how soon the material can be delivered, and send Samples of the same to the Master of the Institution, Earlswood Common, Redhill.

Tenders to be delivered to me in sealed envelopes, endorsed outside "Tender for Stone," on or before Monday, the 14th December instant.

The Guardians do not bind themselves to accept the lowest or any Tender.

FRANK C. MORRISON,
Clerk to the Guardians.

46 High-street,
Reigate.
December 3, 1914. (2,145)

Institution of Municipal and County Engineers.

WEST MIDLAND DISTRICT MEETING AT BIRMINGHAM.

A meeting of the district committee of the West Midland District of the Institution of Municipal and County Engineers took place in the Council House, Birmingham, on Saturday last week. The meeting of the District Committee was preceded by a paper by Mr. E. J. [illegible], Assoc.M.Inst.C.E., on "Drainage, Sewerage and Sewage Disposal as applied to small towns and villages, with special reference to the Rural District of Kidderminster." Mr. A. D. Greatorex (West Bromwich) presided, and there were present Messrs. F. A. Bridge (Birmingham), W. H. A. Crump (Sutton Coldfield), H. J. Coleby (Atherstone), F. C. Cook (Nuneaton), [illegible] district secretary), J. Gummage (Dudley), C. J. Gettings (Worcester), W. H. Jakes (Tipton), C. E. Lawton (Birmingham), J. Monnot (Staffordshire), R. C. Moon (Nuneaton), A. E. Newey (Foleshill), W. Osborne Dean (Malvern), A. S. Parsons (Birmingham), W. Plant (Stafford), H. Richardson (Birmingham), Shotto Douglas (Kenilworth), H. E. Stilgoe (Birmingham), C. F. Wike (Sheffield) and W. P. Young (Walsall). Royal members: L. J. Goodacre (Shrewsbury), H. W. Lawson (Birmingham), A. G. Tomes (Birmingham) and E. W. Turner (Birmingham), associate-members; and P. A. Benn (Lichfield) and R. F. Tabor (Shrewsbury), visitors.

The Chairman read a letter from Mr. A. T. Davis, county surveyor of Staffordshire (district chairman), apologising for his absence, owing to military duties.

Mr. Dean read a [illegible] paper, [illegible] the proceedings [illegible] and [illegible] the discussion [illegible] Mr. [illegible] and the [illegible] read [illegible] paper.

ELECTION OF DISTRICT COMMITTEE.

The meeting then proceeded to the election of the District Committee for the year.

Mr. F. C. Cook, district secretary, stated that Mr. W. B. Chancellor, Lichfield, had left the district, and Mr. Goodacre had removed from Nuneaton to Shrewsbury.

The following were elected:

Warwickshire.—Messrs. Shotto Douglas (Kenilworth), J. Willmot (Warwickshire), H. H. Richardson (Birmingham), A. R. Gray (Birmingham), and H. J. Coleby (Atherstone).

Worcestershire.—Messrs. C. F. Gettings (Worcestershire) and F. Woodward (Stourbridge).

Staffordshire.—Messrs. A. D. Greatorex (West Bromwich), H. J. Clarson (Tamworth), G. Green (Wolverhampton), W. Plant (Stafford), and R. Blanchard (Cannock).

Shropshire.—Messrs. G. C. Lacey (Oswestry) and E. J. Goodacre (Shrewsbury).

Herefordshire.—Mr. W. Jack (Hereford).

TIMBER AND ITS RELATION TO THE BUILDING BY-LAWS: DISCUSSION OF MR. GOODACRE'S PAPER.

Mr. W. Plant (Stafford) proposed a vote of thanks to the author of the paper. There was very little in the paper with which any of them would be disposed to quarrel. It contained a good deal of very useful information. In regard to the bearing of bressemers, it was a fact that a great many builders provided the 4 in. asked for in the by-laws on the bearing only, splaying the ends off, as stated in the paper. It seemed a very short-sighted policy, as the saving was very small. Mr. Goodacre's experiments as regarded dry rot were very valuable. It would be interesting to them to know how he succeeded in introducing dry rot in three days; it seemed a particularly short period in which to set it up. He would also like to know whether he had formed any opinion as to how its recurrence could be prevented when replacing the woodwork. He had a case very similar to that shown in the paper in which the dado of a room was absolutely permeated throughout. He wanted to know how the mycelium could be detected, and if the wood affected was entirely removed, whether the germs of dry rot which might remain on the walls could be destroyed by spraying with chemicals, or in any other way. It would certainly appear desirable to ventilate the underside of the floors by means of a flue, but he was afraid it was very seldom done. In reading the by-laws literally as to the opening of windows, he thought it was pretty clear that one half of the window should open and not an area of one-twentieth of the floor space. As to Mr. Goodacre's suggestions with regard to staircases, he thought the builders did often fail in regard to the construction of staircases of small houses where they were cramped for room. He had come across cases where the builder had actually encroached upon the upper landing with the top step. He would add to the suggestions made by the author in his paper with regard to staircases that they should not open out of the living-room, a practice often adopted in small property.

Mr. A. S. Parsons (Birmingham) said he would second the vote of thanks to Mr. Goodacre for his paper; but, all the same, he wanted to quarrel with him. It was in connection with this practice of cutting the deals forming the bressemer on the splay. Mr. Goodacre said it was a common practice, but, personally, he had not come across it. Perhaps the builders in Birmingham were better than in other towns. But it did not weaken the bressemer to splay the end off at an angle of 45 deg. The only way in which the bressemer could be cut off would be on a vertical shear. The strength of the vertical shear was equal to twice that of the horizontal shear; it had only one-half to two-thirds of the resistance on the vertical shear. Therefore, even with depth, the beam was twice as strong vertically with 4 in. bearing than it was horizontally, and for that reason they could cut off at 45 deg. without impairing the stability. Then Mr. Goodacre said the site should be covered with at least 4 in. of cement concrete. He thought they were all agreed that that was desirable, but he believed the cost of it was prohibitive; certainly 4 in. of concrete made 5 to 1 would cost a guinea a cube yard, and put a considerable amount on the cost of a house. The Birmingham by-laws in Birmingham allowed of some choice. They provided that where the dampness of the site shall render the precaution necessary the whole site shall be covered with a layer of good cement concrete. He did not think it was necessary or desirable to make the covering of the site with cement concrete. They had in Birmingham a by-law to regulate the stability of floors and roofs. The omission of that power had caused them some trouble, and the Birmingham Corporation applied to the Local Government Board this year for powers to enable them to regulate this, and they had by-laws sanctioned which he would read: "Every person who shall erect a new building shall cause every roof of such building to be constructed and supported in such a manner as to secure due stability. Every person who shall erect a new building shall cause every floor of such building to be so supported, and every floor thereof the structure of which is not regulated by the by-laws of 1910 to be so constructed as to secure due stability." That was a by-law giving very wide powers; whether it was a new one he did not know. It certainly empowered them now to say exactly how a roof should be constructed, and it gave them power to decide what was due stability both for roofs and floors. They found the power very valuable indeed.

The Chairman (Mr. Greatorex): May I ask whether those by-laws are granted under the Private Act of the Birmingham Corporation?

Mr. Parsons: I am not prepared to say. I do not think it is. The print says allowed by the Local Government Board.

The Chairman: Is that passed by the Local Government Board through some clause in the Private Act?

Mr. Parsons: No, I do not think so. There was nothing at the end of the by-law making that reservation. He imagined it was a new by-law, but he was not certain. He was bound to say that he admired the author's ingenuity and his research in inoculating these samples of material with *merulius lachrymans*. He, like Mr. Plant, was surprised at

[illegible] tunnel with [illegible] timber.

[illegible] with the suggestion in the paper that a fireclay [illegible] amended. He thought, generally speaking, that [illegible] cerned, were needless. One had to carry the party walls at the same thickness right through the roof [illegible] perty in which, so far as his experience went, [illegible] with Mr. Goodacre as to the absolute neces- [illegible] own by-laws in Nuneaton were redrafted some five or six years ago, and he had a great deal of difficulty in persuading the committee to agree with [illegible] provision for from 4 in. to 6 in. of concrete under boarded floors, and under brick floors, so largely used in kitchens, that a layer of ashes should be provided. The suggestions Mr. Goodacre made in regard to staircases were, he thought, extremely valuable. Dangerous staircases, so far as their pitch was concerned, were due very largely to the cramping of the frontage. In his district there was a local custom which was very difficult to break through, by which nearly all houses for the working classes were built in pairs, with a frontage of 30 ft.—15 ft. each—less 3 ft. for an entry. The staircases were nearly always run parallel to the frontage of the building; so, obviously, there was very little room to get a proper tread in. One was constantly hampered in many cases by local customs of this sort. As Mr. Goodacre knew, the Local Government Board had issued by-laws made under the Public Health Act of 1891, providing for the scantlings of floors, roof timbers, and so on. He had not been able to induce his committee to adopt those by-laws; but, to his mind, they were extremely valuable.

Mr. W. A. H. Clarry (Sutton Coldfield) said the question which had been puzzling him all the time [illegible] —was it from the Model By-laws, or from a code of by-laws actually in operation? He had with him a code of by-laws made in 1901 which was taken from the Local Government Board Model By-laws, but it had had most of the points Mr. Goodacre had mentioned. There were eight or nine pages dealing with the diameter of staircases, but he must say that the by-laws as to staircases were not so good as those mentioned by Mr. Goodacre. It did not give one the rise of the stairs, but the size of the diameter. The question which interested him most in the paper was that of dry rot. He wished Mr. Goodacre could solve the problem how to detect the mycelium in timber which was going to be used in the erection of houses. In places where there were 200 or 300 houses going up at the same time this was a serious matter. Some of the best architects in Birmingham who had built their own houses in his district had experienced the worst trouble with dry rot of anyone in the borough. He knew the case of a very prominent Birmingham architect who had had to take the timber out three times. If architects could not find out and detect dry rot, he feared it would be a very difficult thing for the surveyor to detect it with the many claims upon his time. Then as to the question of window opening. Surely they could not put a window in of more than one-tenth of the floor area, and compel the owner to make it open more than one-twentieth of that area. If he put it larger than that it was his own lookout. He must admit that he was disappointed in the paper in one respect. They had heard so much about cheapening the cost of building cottages and dwellings for the working classes, that he came quite prepared to hear some remedy for cheapening the building of workmen's cottages. That was particularly interesting to him at the present time, as he was trying to get out plans [illegible] cult matter. It appeared that they required some alteration in the by-laws. The only alteration he could see to be possible at the present time was to reduce the height of rooms, which were now 9 ft. for the ground floor and 9 ft. for the bedrooms. If that could be brought down to 8 ft., or 8 ft. 6 in., it would reduce the cost of building working men's houses. To try and cheapen the cost in any other way was almost an impossibility. The author had not given them all the powers which were required in by-laws in regulating the use of wood. They could put in their joists to comply with the by-laws, but there was nothing to say a man should not put in ½-in. matchboard on the top. He knew a whole street of houses which were built with ¾-in. matchboard, and the legs of the bedsteads went through the floors, and to prevent that the joists were marked so that the bed could be put over the joists. He had a case in which they were trying to erect some cottages for £120 or £130, and the architect was trying every move to bring the cost down. As these houses were 5 miles away from the office it meant three or four [illegible] There was a large living room, where the whole of the cooking would be done, and the family would be living in that room until they went to bed at ten or eleven o'clock at night. It was not intended to put any ceiling in that room; and there was nothing in the by-laws to compel the putting in of a ceiling. After that house had been used all day the bedroom above would not be very savoury. To show that ceilings were required in the scullery, where there would be a little steam from the family washing, he put a ceiling in; but in the living-room he did not. There was no by-law as to how windows should be constructed. The windows they put in these cheaper houses were put together anyhow with nails or tacks, and they had to be careful that they did not come undone. In many cases they opened ¼ in. while they were putting them in. The same thing applied to the doors and the roofs. The only way to get a watertight roof was to let them put it up and then get the tenant to complain and have it condemned under the sanitary by-laws. There was nothing in the by-laws that there should be an impervious roof. He was not so certain about the layer of concrete over the site. He thought they would find that many medical men and medical officers of health thought it was well for the site to breathe. If they had a good subsoil it seemed to be a good thing to leave the concrete off. He had found it so with a gravelly subsoil. If the drains were watertight they got no leakage under the floors, and it seemed to him the concrete was not necessary. It should be left to the discretion of the surveyor, and if the surveyor thought it necessary, a layer of concrete 6 in. thick should be laid.

Mr. W. Plant (Stafford) said he did not agree that concrete over the site of houses might be omitted. He would tell them what happened some time ago in his own house, the site of which was not concreted. A bad smell was noticed in one of the rooms; the drains were opened out and found to be leaking. The drains had become blocked, and, acting under pressure, they leaked at the joints, so that the ground under the house was permeated with sewage. For that reason, if for no other, it was essential that they should have concrete under the houses. It need not necessarily be 5 to 1 concrete, as suggested in the paper; it might go up to 8 to 1. He was surprised to hear Mr. Clarry say that their by-laws specified the dimensions, joists, &c. His council had put in the dimensions in their new by-laws, but they were struck out by the Local Government Board.

Mr. H. J. Coleby (Atherstone) thought Mr. Goodacre was deserving of great credit. He supposed he had not tabulated any of his results as to dry rot in various beams. He did not think he could agree with the other speakers as to the provision of concreting under floors. He thought it was a very necessary provision in every case. He was certain the dry rot in timber was worse where they had a damp condition, and if they had a floor without any protection by concrete, they were bound to get damp under that floor at some time or other. He did not think there was any soil but had some damp in

[illegible], and even with sand or gravel there must be damp [illegible] with a heavy rainfall after a dry period [illegible] and they get the damp [illegible] driven up into the house. As to the [illegible] he supposed there was no cure. The question was Why one bailies at all? He thought [illegible] something else, and put in [illegible] in expanded metal, or something of that kind. He thought it would be worth trying at any rate.

Mr. C. F. Gettings (Wiltshire) said he had been particularly interested in one or two of the points raised in the discussion of the paper. One raised by Mr. Clarry was with regard to the height of rooms. Mr. Clarry said that the minimum height under their [illegible] was 9 ft. It struck him that was rather excessive; in many towns the minimum height was only 8 ft. If they were compelled to build the rooms of an ordinary artisan's house to 9 ft., it did add very considerably to the cost. There [illegible] Mr. Goodacre's paper where he referred to giving greater power to surveyors. Personally, he did not think that was desirable at all. [illegible] had sufficient opportunity [illegible] to know the ones upon him to do [illegible] the absolutely correct thing to do would place him in a serious position. That, he thought, should be decided by the higher authorities.

The Chairman (Mr. Greatorex) said he was sure Mr. Goodacre must feel gratified with the discussion which had taken place upon his paper. Personally, he thought it had been of advantage to all of them. He would like to add his thanks to Mr. Goodacre for coming forward and keeping their session going at this particular time. He rather agreed with Mr. Gettings as regarded the putting of too much power in the hands of those who had to deal with by-laws. The Local Government Board were not inclined to leave it an open question as to how by-laws should be dealt with by surveyors, but were very strong in having cases which set down what should be done and not done. He agreed that it should be definitely laid down in the by-laws rather than they should have more difficulties than they had at the present time. The paper was very interesting, particularly to those who had to carry out the building by-laws and had to deal with building in the various towns. Mr. Gettings had very kindly promised to read a paper on road construction at a meeting to be arranged after Christmas. This, he felt, would be a very interesting paper, because none of them had finished learning on the subject of road construction.

Mr. Goodacre, in reply, thanked the members for the way in which they had received his paper, and replied to one or two points raised in the discussion. Mr. Plant asked the method of carrying out the tests for dry rot. He might say that they were carried out in a cellar in which the mycelium abounded. The pieces of wood were placed in a convenient position, such that the mycelium could be drawn on to each specimen. He hoped to be able to give further particulars later in the *Journal*, as suggested by Mr. Coleby. They had now been there for three months. Mr. Plant referred to a dado which [illegible] attacked by dry rot, and asked whether he could make any suggestions as to treatment. The only thing he could suggest was to get at the root of the trouble, cut away all the infected timber, and coat any adjacent woodwork with a strong solution of copper sulphate or sulphuric acid. Then measures should be taken for prevention, ensuring that the floor and dado were well ventilated and free from damp. Then, as regarded the opening of windows, he might be wrong, but it always seemed to him that this by-law was very ambiguous as to whether the opening should be one-twentieth of the floor area or one-half of the window. They had the case of a builder who constructed a very large window and then opened only a small portion of it, equal to one-twentieth the floor area. He very much doubted whether it actually complied with the by-law.

A Member: I think the by-law is very clear; it certainly says one-half of the window.

Mr. Goodacre: Then, coming to Mr. Parsons, he was very interested in his theory as to vertical and horizontal shear in floor joists and beams, and quite agreed with him in the application of this theory to such structural material as steel; but when they applied this to timber they had to deal with a different material, because it was very liable to shakes, large knots, and other defects, and he did not think the economy in timber was worth the risk of cutting away the ends of joists on the splay. Then as to concrete under floors. He was perfectly convinced that concrete should be under all floors. It was only a cost of about £3 for the average cottage; on the other hand, if they did get dry rot afterwards they could soon spend £3 in putting in new floors. Birmingham was fortunate in having by-laws regulating the strength of floors. Mr. Clarry also mentioned the Model By-laws. He might say that he obtained the Local Government Board draft Model By-laws as recently as last October, and they were the basis of his criticism. With regard to the detection of dry rot, that was a difficulty. He did not think that dry rot could be detected in many cases when the beam was being fixed. The chief point was to take every precaution, so that if dry rot was latent in the timber it should not be allowed to develop. With regard to the building of cheap houses, he was sorry that he had not put anything in his paper to lessen the cost of erection of dwellings. He thought, however, his suggestions would tend to make them more sound without materially increasing the cost. The only way to cheapen dwellings was economy in design, and he thought some by-laws might be relaxed with this end in view, but not those with regard to timber. With regard to Mr. Gettings' remarks as to discretionary powers being left in the hands of the surveyor, he opined in these extraordinary circumstances some standardised formula with a coefficient obtained by actual experiment might be used to ascertain the size of floors, joists, &c. It seemed quite unnecessary to specify for every different case that might crop up.

METROPOLITAN WATER BOARD ENGINEERSHIP.

MR. RESTLER APPOINTED.

Mr. James William Restler, M.Inst.C.E., M.I.Mech.E., was on Friday last appointed, at a salary of £5,747 per annum, chief engineer to the Metropolitan Water Board, in succession to Mr. W. B. Bryan, deceased.

Mr. Restler, who was born in 1851, was educated at a private school and King's College. He was chief engineer to the Southwark and Vauxhall Water Company from 1883 until the formation of the Metropolitan Water Board in 1904, when he was appointed chief deputy to Mr. Bryan. The works constructed under Mr. Restler's direction consisted of engines capable of raising 140,000,000 gallons per day, reservoirs to contain 1,800,000,000 gallons, filter-beds having an area of 40 acres, five tunnels under the Thames, and various deep wells, and other works representing an expenditure of over £2,500,000. The vast reservoirs at Honor Oak and other works at Chingford were also completed during Mr. Restler's tenure of office.

It should be stated that the salary of the office of chief engineer is £2,500, and that the remainder of the sum to be received by Mr. Restler consists of £3,247 per annum compensation accruing to him for the abolition of his office as engineer to the Southwark and Vauxhall Water Company. Mr. Restler possesses every necessary qualification for such an important post as chief engineer to the Metropolitan Water Board, as in the words of the report presented to that authority by the Works and Stores Committee, he has obtained "an unrivalled knowledge and experience of the London water question." It was, the committee added, with the utmost confidence that they proposed his appointment.

Rhymney Valley Sewerage.—The Rhymney Valley Sewerage Board have accepted the tender of Messrs. Barnes, Chaplin & Co., Cardiff, at £62,792, for Contract No. 2 of the extension works from Tynycoed to Pontlottyn Bridge.

A Glossary of Road Terms. By H. Percy Boulnois, M.Inst.C.E. Price 2s. nett. The St. Bride's Press, Limited, 24 Bride-lane, E.C.—The compiler of this road vocabulary says in his modest introduction: "Someone had to make a start," and it cannot be denied that with the thousand and more words he has collected a very good start has been made. . . . Every reader of the glossary will recognise the industry of which proof has been given in its compilation, and due credit will be awarded for the courage and independence shown in the definition of some terms which have hitherto been the subject of much heated discussion.—*Sanitary Record.*

SUPERVISION AND MAINTENANCE OF RURAL MAIN ROADS.

WILTS COUNTY SURVEYOR'S PROPOSALS.

[illegible] of Wiltshire, Mr. J. G. Powell, [illegible] Roads and Bridges Committee [illegible] the desirability of reorganising the present system of supervision and maintenance of main roads in rural districts. He stated that the [illegible] fully in their work, by the employment of road foremen. [illegible] and would [illegible] contractors on about [illegible] main roads. [illegible] he got to the end of it. He was of opinion that capable men could be obtained at a salary of 30s. per week. The cost of putting the scheme into operation [illegible] week for one year, £1,560. The work in his office, [illegible] ably increased, and no doubt he should be compelled to ask for a recognised deputy or assistant, and [illegible] vinced that the scheme would not prove to be more expensive than the present system, while the advantages to be gained by constant supervision and in[illegible] would be very great value. There would also be a benefit financially arising out of the purchase of road material. At present a comparatively small amount of material was purchased annually by ten rural district councils. Assuming the new scheme was adopted, the whole of the materials forming ten different contracts would form one large contract of about 45,000 tons. Obviously, a stone merchant would quote a different price for 45,000 tons than he would for 4,000 to 5,000 tons. From experience he found the difference to be about 3d. per ton, and on 45,000 tons there would be a saving of £562, which would more than pay for the additional staff that would be required to work the scheme.

The Roads and Bridges Committee, in submitting this report to the county council, stated that they had decided by a majority that no change should be made in the present system, but that the attention of the district surveyors should be called to the need for closer supervision.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

President Dr. MacLean Wilson, B.Sc.

ANNUAL GENERAL MEETING.

The annual general meeting of this association will be held at the Holborn Restaurant on Thursday, December 10th, at 3.30 p.m.

The chair will be occupied by Dr. Samuel Rideal, D.Sc., F.I.C., F.C.S.

BUSINESS.

Read minutes of last meeting.
Chairman's report.
N.A.L.G.O. delegates' report.
Balance-sheet.

Resolution of council:—

"That the council recommend the association, at the annual meeting, to pay a contribution of £25 from the funds of the association to the Prince of Wales' National Relief Fund."

Presentation of an illuminated address to Mr. Chas. H. Ball, M.R.San.I.

Paper to be read by Mr E. Ardern, M.Sc., Manchester, "A Recent Development of the Sewage Problem."

The council at their meeting on October 21st decided that, in view of the state of national affairs, the annual dinner should not be held this year.

J. B. Croll,
Hon. Secretary.

INSTITUTION OF WATER ENGINEERS.

WINTER GENERAL MEETING.

The nineteenth winter general meeting, being the fourth statutory annual general meeting of the institution, will be held at the apartments of the Geological Society, Burlington House, W. (kindly lent for the purpose by the president and council of that body), on Friday, and if necessary Saturday, December 11th and 12th. Proceedings will commence at 2 p.m. on Friday and 11 a.m. on Saturday.

The following papers will be read and discussed:—

(1) "Notes on Scraping a 15-in. Trunk Main at Batley," by J. C. Barrowclough, waterworks engineer.

(2) "The Whitton Pumping Station of the Ipswich Corporation Waterworks," by C. W. S. Oldham, corporation water engineer.

PROGRAMME.

(1) The minutes of the nineteenth ordinary summer meeting, held at Stockport, will be read and submitted for confirmation.

(2) The statement of accounts for the year 1913 (see "Transactions," Vol. xviii., pp. 282-283) will be submitted for formal adoption by the members.

(3) The ballot will be taken for the election of the council for the year 1915-16.

(4) The president, on behalf of the council, will move: "That Messrs. Wood, Drew & Co. be and are hereby appointed auditors to the institution for the year at a fee of five guineas, and that Messrs. Herbert Lapworth, D.Sc., and Arthur Valon be and are hereby elected honorary auditors to the institution for the same period."

(5) The president will move: "That the members present at this meeting do confirm the decision of the council to subscribe from the accumulated fund of the institution a sum of fifty guineas to the Prince of Wales' War Relief Fund and a sum of twenty guineas to the funds of the Red Cross Society."

(6) Reading of papers and discussions thereon.

Percy Griffith,
Secretary.

20 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those requisite for their despatch are recommended to ensure that they shall reach The Surveyor office by noon on Wednesdays to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 7272) subject to later confirmation by letter.

COUNTY SURVEYOR'S CLERK.—December 7th. West Suffolk County Council.—County Surveyor, Shire Hall, Bury St. Edmunds.

TEMPORARY JUNIOR DRAUGHTSMAN.—December 9th.—Corporation of Chelmsford. 25s. per week.—Mr. Percival T. Harrison, borough engineer.

TEMPORARY CLERK.—December 9th.—Corporation of Chelmsford. 20s. per week.—Mr. Percival T. Harrison, borough engineer.

TEMPORARY ASSISTANT AND DRAUGHTSMAN.—December 10th.—Shoreditch Borough Council. £2 10s. per week.—Mr. T. L. Hustler, borough engineer, Town Hall, Old-street, E.C.

INSPECTOR OF NUISANCES.—December 11th.—Wirral Rural District Council. £125 per annum.—Mr. J. E. S. Olive, clerk, 54 Hamilton-street, Birkenhead.

SURVEYOR.—December 12th.—Aylesbury Rural District Council. £120 per annum.—Mr. F. H. Parrott, clerk.

TEMPORARY ASSISTANT.—December 12th.—Corporation of Bridlington. £2 per week. Mr. A. E. Matthewman, town clerk.

TEMPORARY TOWN PLANNING ASSISTANTS.—December 14th.—Corporation of Grimsby. £130 a year.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

JUNIOR ASSISTANT.—December 17th.—Corporation of Stoke-on-Trent. £75—£95 a year.—Mr. A. Burton, borough surveyor, Town Hall.

BOROUGH SURVEYOR.—December 29th.—Corporation of Sandwich. £150 a year.—Mr. E. C. Byrne, town clerk.

CITY ENGINEER AND SURVEYOR January 31st, 1915.—Port-of-Spain Corporation £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

DRAUGHTSMAN CLERK.—Survey Department of the East Africa Protectorate. £160—£205, and house allowance £40.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

ENGINEERING ASSISTANT.—Corporation of Newport (Mon.). £2 2s. per week.—Mr. H. Trevor-Ring, borough engineer and water engineer.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those received by post for their despatch are recommended to arrange that they should reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of competitions. Such advertisements may, in cases of emergency, be telephoned (City No. 1046) subject to later confirmation by letter.

BEDS.—December 7th.—Designs for a secondary school, for the county council.—Mr. W. W. Marks, clerk, Shire Hall, Bedford.

DUMFRIES.—December 31st.—Competitive plans for workmen's dwellings, for the Dumfries Corporation.—Town Clerk.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

BRADFORD.—Designs for the replanning of streets in the central area of the city, for the corporation.—Mr. Reginald Bloomfield, R.A., has been appointed assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those received by post for their despatch are recommended to arrange that they should reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of competitions. Such advertisements may, in cases of emergency, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

BILLINGE.—December 7th.—For constructing a borehole for water supply purposes, for the urban district council.—Mr. A. Darlington, clerk, Council Offices.

HANTS.—December 7th.—For the erection of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

SHEFFIELD.—December 7th.—For the erection of a school medical department, and alterations to a school building, for the Education Committee.—City Architect, Town Hall.

ARKLOW.—December 7th.—For the erection of 100 houses, for the urban district council.—Mr. L. O'Toole, Main-street, Arklow.

STAFFS.—December 8th.—For the erection of a council school, for the county council.—Mr. Graham Balfour, director of education, County Education Offices, Stafford.

BARNES.—December 8th.—For building a dispensary and tuberculosis wards at the hospital, South Worple Way, for the urban district council.—Mr. G. Bruce Tomes, surveyor.

BIRMINGHAM.—December 9th.—For alterations to public baths, for the Baths Committee.—Mr. R. Hoggin, superintendent engineer, Kent-street.

GRIMSBY.—December 9th.—For additions to the public library, for the corporation.—Mr. H. G. Whyatt, borough engineer and surveyor.

LEEDS.—December 9th.—For building an administrative block at the small-pox hospital, for the corporation.—Mr. W. T. Lancashire, city engineer.

ST. THOMAS.—December 10th.—For the construction of waterworks, for the rural district council.—Mr. S. R. Lowcock, 6 Queen Anne's-gate, Westminster, S.W.

PEMBROKE.—December 10th.—For the erection of a school, for the Education Authority.—Mr. O. T. Thomas, architect, County Education Offices, Haverfordwest.

LAMBETH.—December 10th.—For the repair and renewal of iron gutters, for the borough council.—Mr. H. Edwards, borough engineer, Town Hall, Brixton-hill, S.W.

NORTHWICH.—December 10th.—For the erection of a school, for the Administrative Sub-committee of the Northwich District.—Mr. A. E. Powles, architect, 7 Winnington-street, Northwich.

WEST BROMWICH.—December 11th.—For the erection of a school, for the Education Committee.—Messrs. Wood & Kendrick, architect, High-street.

PONTYPRIDD.—December 14th.—For the erection of a school, for the Education Committee.—Mr. W. E. Lowe, engineer and surveyor.

KIDDERMINSTER.—December 14th.—For the construction of about 3 miles of cast-iron water mains, principally of 4-in. and 3-in. diameter, valves, hydrants, meters, and meter chambers, for the rural district council.—Mr. W. Fiddian, engineer, Stourbridge.

KIDDERMINSTER.—December 14th.—For providing, laying, and jointing 1,587 yds. of 3-in. cast-iron water mains, and other appurtenant works, for the rural district council.—Mr. G. J. Shepherd, engineer, 85 Chester-road, Kidderminster.

LEITH.—December 14th.—For additions to the Academy, for the School Board.—Mr. G. Craig, architect, 85 Duke-street, Leith.

WALTHAMSTOW.—December 14th.—For alterations to a school, for the Education Committee.—Mr. H. Prosser, architect, High-street.

SOUTHEND.—December 14th.—For the erection of an electricity sub-station and incidental works, for the corporation.—Mr. E. J. Elford, Municipal Buildings.

LANCS.—December 15th.—For additions to Peel Hall, near Bolton, and converting the premises into a sanatorium, for the county council.—Mr. Henry Littler, county architect, 16 Ribblesdale-place, Preston.

BIRKENHEAD.—December 15th.—For the erection of a sanatorium, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

LEEDS.—December 16th.—For the erection of a tramway shed and other buildings, for the corporation.—Mr. A. E. Kirk, architect, 63 Albion-street.

WEST RIDING.—December 18th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

SPALDING.—December 19th.—For building six cottages, for the rural district council.—Messrs. Davis & Cowley, architects, 6 Double-street, Spalding, or 2 York-row, Wisbech.

SLEAFORD.—December 24th.—For providing and laying about 6 miles of water mains, construction of tower, reservoir, and other works, for the rural district council.—Mr. W. B. Marsden, engineer and surveyor.

EAST STOW.—December 30th.—For the erection of working-class dwellings, for the rural district council.—Mr. H. E. Wilkes, clerk, Council Offices.

BATTERSEA.—January 1st.—For the erection of a dust destructor, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

CHEPPING WYCOMBE.—January 5th.—For the construction of a ferro-concrete bridge on the Hennebique system, and laying a short length of sewer and surface-water drain, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

BOMBAY.—January 7th.—For the complete manufacture, erection and equipment of a refuse destructor for the incineration of 200 tons of refuse per day, for the municipality.—Mr. P. R. Cadell, municipal commissioner, Municipal Offices, Bombay, India.

FIFE.—For the construction of a sanatorium, for the county council.—Mr. A. C. Dewar, architect, Leven.

Iron and Steel.

BIRKENHEAD.—December 7th.—For the construction of pipe line consisting of 11¾ miles of cast-iron and steel pipes, tunnel and tanks, for the corporation.—Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

FIFE.—December 7th.—For providing cast-iron pipes and special castings, for the Kirkcaldy District

[illegible]—Messrs. J. & A. Leslie & Reid, 72a George-street, Edinburgh.

BIRKENHEAD.—December 7th.—For the supply of cast-iron valves and with valves boxes and gratings, for the corporation.—Sir Alexander Binnie, Son & Deacon, St. Stephen's House, Victoria-embankment, London, S.W.

LEICESTER.—December 12th.—For the supply of cast-iron pipes and connections, for the Gas Committee.—Mr. H. Pooley, engineer and manager, Gas Offices, Millstone-lane, Leicester.

SHEERNESS.—December 14th.—For the provision and erection of steam, exhaust, air, water, and other pipes, together with the necessary valves, and other works, for the urban district council.—Mr. F. W. Stanton, 3 Victoria-street, Westminster, S.W.

MANCHESTER.—December 16th.—For the supply of water-tube boilers and alternators, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Committee, Town Hall.

THAKENHAM.—December 19th.—For the supply of cast-iron spigot and socket pipes for the Storrington water supply, for the rural district council.—Major Tulloch & Haworth, engineers, 28 Victoria-street, Westminster, S.W.

SEVERN.—December [illegible]—For providing, laying, and jointing about 4½ miles of cast-iron water mains, with valves, hydrants, air valves, and the construction of engine-house and reservoir, for the rural district council.—Messrs. Willcox & Raikes, Union-chambers, 63 Temple-row, Birmingham.

Roads.

ROMFORD.—December 7th.—For the supply of Guernsey granite, for the rural district council.—Mr. G. Lapwood, highway surveyor.

CAMBRIDGE.—December 7th.—For the supply of broken granite, syenite, basalt, or similar stone.—Borough Surveyor, Guildhall.

NEATH.—December 7th.—For making up certain streets, for the rural district council.—Mr. D. M. Davies, engineer, Council Offices.

WANDSWORTH.—December 7th.—For work of making up and paving, for the borough council.—Mr. P. Dodd, borough engineer, Town Hall.

EDMONTON.—December 8th.—For works of private street improvement, for the urban district council.—Mr. C. Brown, surveyor, Town Hall, Lower Edmonton.

CAERPHILLY.—December 8th.—For making up certain streets, for the urban district council.—Mr. A. O. Harpur, surveyor.

BUCKHURST HILL.—December 8.—For the supply of 140 tons of broken granite and hire of steam roller, for the urban district council.—Mr. T. J. Tee, clerk, Council Offices.

ROCHDALE.—December 9th.—For making up certain streets, for the corporation.—Borough Surveyor.

EASINGTON.—December 9th.—For making up and paving certain streets, for the rural district council—Mr. G. Waterhouse, surveyor.

WESTBOURNE.—December 10th.—For the supply of hand-picked field stones, gravel and shingle gravel, for the rural district council.—Mr. H. Norris, surveyor, West Ashling, Chichester.

WARSOP.—December 12th.—For road improvement works, for the urban district council.—Messrs. Vallance & Westwick, White Hart Chambers, Mansfield.

HORSHAM.—December 12th.—For the supply in barrels of 40 gallons' capacity of about 25,000 gallons of tar, for the rural district council.—Mr. W. Dengate surveyor, 58 Park-street, Horsham.

WILTS.—December 14th.—For the supply of road metal for a period of one year, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WILTS.—December 14th.—For steam rolling the London and Bath trunk road, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WILTS.—December 14th.—For the supply of tools for work on 348 miles of main roads, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WILTS.—December 14th.—For spraying with Tarvia on lengths of main roads, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WARRINGTON.—December 14th.—For the supply of concrete flags, Rawtenstall flags, dressed kerbs, granite setts, and Lithofalt paving blocks, for the corporation.—Borough Surveyor.

FAVERSHAM.—December 14th.—For the supply of 1,000 tons of granite and granite chippings, for the corporation.—Town Clerk.

BIRMINGHAM.—December 15th.—For the supply of 1,500 tons of coal-gas tar, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

ALDERSHOT.—December 15th.—For the supply of Hungry Hill flints, basalt or limestone, and fifty 40-gallon iron drums or iron barrels suitable for holding tar, for the urban district council.—The Surveyor.

BIRMINGHAM.—December 15th.—For the maintenance and repair of asphalt pavements, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

TUNBRIDGE WELLS.—December 16th.—For making up certain streets, for the corporation.—Mr. W. H. Maxwell, borough engineer and surveyor.

BERKS.—December 16th.—For the supply of broken road materials, gravel and sand, for the county council.—Mr. J. Fred Hawkins, county surveyor, Shire Hall, Reading.

WEYMOUTH.—December 16th.—For the supply of material for tar-spraying, for the corporation.—Mr. K. J. S. Harris, borough engineer and surveyor.

CROYDON.—December 17th.—For making up a road, for the rural district council.—Mr. R. M. Chart, surveyor.

HUDDERSFIELD.—January 4th.—For the supply of a motor-driven street sweeping machine, with collecting van attached, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

WOODSTOCK.—January 11th.—For the supply of best hand-picked unbroken stone, best broken stone (2-in. gauge), best double-screened nuts, and binding chippings, for the rural district council.—Mr. A. G. Higgs, clerk.

LOUGHBOROUGH.—For works of making up and repair, for the corporation.—Mr. A. H. Walker, borough surveyor.

DUBLIN.—For the supply of 1,000 tons of granite paving setts, for the Dublin United Tramways Company.—Mr. R. S. Tresilian, secretary, 9 Upper Sackville-street, Dublin.

Sanitary.

STANLEY.—December 7th.—For the construction of main pipe sewers, for the urban district council.—Mr. E. H. Middlebrook, clerk, 71 Queen-street, Morley.

CROYDON.—December 7th.—For the supply of about 4,000 sq. yds. of under-drainage tiles for percolating filters, for the corporation.—Borough Engineer.

ETON.—December 7th.—For the supply of disinfectants, for the rural district council.—Mr. H. Thompson, acting clerk, Stacey House, Slough.

CROYDON.—December 7th.—For the supply, erection and maintenance of nine revolving sewage distributors, for the corporation.—Borough Engineer.

KEIGHLEY.—December 8th.—For the construction of an 18-in. pipe sewer, for the town council.—Borough Engineer.

BIRMINGHAM.—December 9th.—For the construction of 937 yds. of stoneware pipe sewer, 1,180 yds. of stoneware pipe surface sewers, manholes, flushing manholes, stoneware drain connections, and ventilating shafts, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor, the Council House.

BINGHAM.—December 9th.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. C. W. Kendrick, sanitary surveyor.

BENTLEY-WITH-ARKSEY.—December 11th.—For laying a 6-in. sewer, and relaying portion of an existing sewer, for the urban district council.—Mr. R. G. Whitley, surveyor.

ECCLES.—December 14th.—For providing and erecting a sewage recording apparatus, for the corporation.—Borough Surveyor.

WAKEFIELD.—December 15th.—For the construction of a main pipe sewer, for the rural district council.—Mr. F. Massie, engineer, Tetley House, Wakefield.

SOUTH SHIELDS.—December 15th.—For the supply of disinfectants, for the corporation.—Mr. D. Morley Mathieson, medical officer of health.

EPSOM.—December 15th.—For works at the sewage farm, including additions and alterations to destructor buildings, with air-compressing machinery and sewage screening apparatus, refuse destructor, two hydrolytic tanks, alterations to settling tanks, laying mains, and other works.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

RHONDDA.—December 15th.—For the construction of a cast-iron sewer 1 mile in length and the supply of cast-iron pipes and specials, for the urban district council.—Mr. H. Barber, engineer and surveyor, Council Offices, Pentre, Rhondda.

RAMSBOTTOM.—December 17th.—For the construction of a percolating filter, sludge filters, sludge wells, sludge carriers, effluent carriers, and other appurtenant works, for the urban district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancs.

TEDDINGTON.—December 21st.—For the construction of tanks, channels, filters, and other works required in the extension of the sewage works, for the urban district council.—Mr. William Fairley, Parliament Mansions, Westminster, and Mr. Marshall Hainsworth, surveyor, Council Offices.

HEBDEN BRIDGE.—December 24th.—For extensions to sewage disposal works, for the urban district council.—Messrs. John Newton, Son & Bayley, 19 Cooper-street, Manchester.

GREAT HARWOOD.—January 9th.—For alterations and extensions at sewage disposal works, for the Joint Sewerage Board.—The Engineers, Martholme, Great Harwood, Lancs.

Stores.

DURHAM.—December 12th.—For the supply of cast-iron direction posts, for the county council.—County Surveyor, Shire Hall, Durham.

GILLINGHAM.—December 22nd.—For the supply of road materials, Portland cement and lime requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal, coke, bricks, paints, oils, varnish, general stores, ironmongery, and disinfectants, for the corporation.—Mr. J. L. Redfern, borough engineer and surveyor.

Junior Institution of Engineers.—On the 14th inst., at the Institution of Electrical Engineers, the Marquis of Graham will deliver his inaugural address as president of the Junior Institution of Engineers, taking for his subject "The War and the Engineer." The proceedings will open at 8 p.m.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted

BURNTISLAND.—For alteration of buildings to provide three dwellings, for the town council.—Mr. J. A. Waddell, burgh surveyor.

MASONS.

Wright & Reekie, Kirkcaldy	£189
Balfour Brothers, Kirkcaldy	172
M. Smart, Kirkcaldy	159
D. Ritkethly, Burntisland *	156
J. Jackson & Son, Burntisland	140

JOINERS.

Bogie & Nicoll, Kirkcaldy	£179
T. Nimmo & Son, Burntisland	168
W. J. Dewar, Burntisland *	155

PLUMBERS.

H. Hutchison & Son, Kirkcaldy	£63
W. Craw, Burntisland	58
Mills & Donald, Edinburgh	58
M. Macaulay, Burntisland *	51

PLASTERERS.

A. Hutchison, Kirkcaldy	£54
W. Anderson, Burntisland	47
Williamson & Son, Burntisland *	38

CHELMSFORD.—Accepted for the supply of Guernsey granite, for the corporation.

W. Griffiths & Co., Ltd., Bishopsgate, E.C.—2 in., 15s. per ton; 1½ in., 15s. 6d. per ton; 1 in., 11s. per ton; ¾ in., 12s. 6d. per ton; ½ in., 13s. 6d. per ton.

EXETER.—For extensions to the municipal offices, for the corporation.—Mr. J. Vaughan, city surveyor.

Westcott, Austen & Tickle, Exeter, £1,037.

HERTS.—For the construction of High Bridge, Redbourn, for the county council.—Mr. J. B. Kellick, county surveyor.

C. Miskin & Sons, St. Albans	£1,025
H. Williams, St. Albans	[illegible]
G. Wiggs & Sons, Watford	[illegible]
A. & S. Hayden, Manchester	[illegible]
O. P. Brewer & Son, Ketter	[illegible]
G. Henson & Sons, Wellingborough	768
W. Wright, Chesham *	739

MIDDLESBROUGH.—For the paving of back streets, for the corporation.—Mr. S. D. Burgess, borough engineer.

J. Crombie & Son, Limited, Middlesbrough.
J. Pearson & Co., Limited, Stainton-on-Cleveland.

NEWMARKET.—For the supply of a steam roller with scarifier, for the urban district council.—Mr. William Henry Eley, engineer and surveyor:—

Clayton & Shuttleworth, Lincoln.
J. Fowler & Co., Leeds.
Ruston & Proctor, Lincoln.
Marshall & Co., Gainsborough.
Burrell & Co., Thetford.
Aveling & Porter, Rochester. £[illegible]

NORTHUMBERLAND.—Accepted for the erection of a school at Monkseaton, for the Education Committee:—

J. Douglass, Newcastle-upon-Tyne, £4,490.

REDCAR.—For making up a road, for the urban district council.—Mr. J. Howcroft, surveyor:—

H. L. Ellison, Redcar	£422
W. Inglett, West Hartlepool	[illegible]

ROCHFORD.—For constructing about 3½ miles of glazed-stoneware and cast-iron pipe sewers, together with manholes and other works, for the rural district council.—Mr. A. C. Madge, surveyor. Mr. John H. Blizard, consulting engineer:—

J. Dickson, St. Albans	£13,601
W. Muirhead & Co., Westminster	13,550
Johnson & Langley, Leicester	13,231
J. Riley, Cheltenham	12,965
Myall Brothers, Southend	12,450
W. Lingwood, junr., Romford	11,968
Davey & Armitage, Southend	11,787
W. & C. French, Buckhurst Hill	11,400
G. Bell & Sons, Tottenham	11,392
T. W. Pedrette, Enfield	10,990
C. Bentley, Emsworth	10,939
W. Iles, Southend *	10,840
B. B. & M. Barrell, Wivenhoe	9,903

Engineer's estimate, £10,900.

ROMSEY.—For steam rolling and scarifying, for the corporation.—Mr. A. J. Jenvey, borough surveyor:—

Price & Woodbridge, Limited, Bath.—Rolling, 3s. 7d. per hour, scarifying, 1½d. per yard super.
Eddison Steam Rolling Company, Limited, Dorchester.—3s. 6d. and 1½d.
Wilts Steam Roller Depot, Trowbridge, Wilts.—3s. 4d. and 1d.

TAVISTOCK.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. T. H. Harris:—

W. Shaddock, Plymouth	£931
Steer & Pearce, Plymouth	734
H. R. Petherick, Lydford *	713

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

DECEMBER.

5.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham.

5.—Lower Thames Valley District Surveyors' Association: Meeting at Twickenham. Mr. E. Willis, ASSOC.M.INST.C.E., on "The Supervision of Buildings under By-laws."

10.—Association of Managers of Sewage Disposal Works: Annual General Meeting in London.

10.—Society of Architects: Discussion on "A Model Form of General Conditions of Contract." 7.30 p.m.

11-12.—Institution of Water Engineers: Winter General Meeting in London.

11.—Junior Institution of Engineers: Marquis of Graham delivers his Presidential Address. Institution of Electrical Engineers. 8 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ENGINEERING ASSISTANT.
Required immediately. Temporary Engineering Assistant for duration of Ward. Salary £2 2s. per week. Applications, giving full particulars, to be sent to H. Tremelling, ASSOC.M.INST.C.E., Borough and Water Engineer, Newport, Mon. (2,135)

PORT-OF-SPAIN CITY COUNCIL.

[illegible] applications for the combined posts of City Engineer and Engineer of the Port-of-Spain Water and Sewerage Works.

2. The salary attached to the post of City Engineer is £100 a year, and to that of Engineer of Water and Sewerage Works, £550 a year, with travelling allowance at the rate of £75 a year.

3. The intention of the Council being that the "City Engineer" and "Engineer of Water and Sewerage Works" should be held by the same person, every application must be for the [illegible]

4. The offices are pensionable under the Port-of-Spain Corporation Ordinance, 1914.

[illegible] Engineer of Water and Sewerage Works, is subject to the approval of the Governor.

6. Candidates must be corporate members of the Institution of Civil Engineers of England, and must possess experience in the design, construction, and maintenance of waterworks and sewerage systems.

7. Applications, accompanied by not less than three recent testimonials, and stating age and previous experience, must be supported by satisfactory evidence that the candidates possess the qualifications set forth in the preceding paragraph of this notice, and must be forwarded so as to reach the undersigned not later than the 31st January, 1915.

8. Candidates must also forward with their applications a medical certificate of fitness for service in the West Indies.

9. The successful candidate will be required to furnish a bond with an approved surety in the sum of £500 for the due performance of the duties of the above offices. He will be required to devote his whole time to the service of the Corporation, and to reside in the City of Port-of-Spain, or within one mile of the limits thereof; and he must be prepared to enter upon the duties of the appointment within one month from the date of the receipt by him of the official notice of his appointment.

JOSEPH ARNOLD LAMY,
Town Clerk.

Town Hall,
Port-of-Spain,
Trinidad, B.W.I.

(2,063)

BOROUGH OF BRIDLINGTON.

TEMPORARY ASSISTANT IN SURVEYOR'S DEPARTMENT.

Applications are invited for the appointment of a Temporary Assistant in the Borough Surveyor's Department. Applicants must be good Draughtsmen, with a thorough knowledge of Surveying, Levelling, Building and Drainage Inspection, and the general work of a Surveyor's Department. Salary £2 per week.

Applications, marked "Assistant Surveyor," stating age, experience, and qualifications, together with copies of two recent testimonials, and stating the earliest date on which the applicant can take up his duties if appointed, must be received by me not later than Saturday, the 12th of December, 1914.

A. E. MATTHEWMAN,
Town Clerk.

Town Hall, Bridlington.
November 25, 1914. (2,130)

COUNTY BOROUGH OF STOKE-ON-TRENT.

BOROUGH SURVEYOR'S DEPARTMENT.

The Corporation invite applications for the appointment of a Junior Assistant in the Borough Surveyor's Office, at a salary of £75, rising, in the discretion of the Council, to £95 per annum.

Applicants must be neat and expeditious Draughtsmen, and accurate Surveyors and Levellers.

Preference will be given to candidates who have had experience in a Borough Surveyor's Office.

Applications, stating age and experience, accompanied by not more than three recent testimonials, and endorsed "Junior Assistant," must be sent to me not later than Thursday, 17th of December, 1914.

Canvassing, directly or indirectly, will be a disqualification.

A. E. EATON, Assoc. M. Inst. C.E.,
Borough Surveyor.

Town Hall,
Stoke-on-Trent.
November 27, 1914. (2,127)

COUNTY BOROUGH OF GRIMSBY.

TEMPORARY TOWN PLANNING ASSISTANTS.

Applications are invited for the position of Temporary Assistant (three being required), with a practical knowledge of the procedure and work required in the preparation of Town Planning Schemes, including Surveying, Draughtsmanship and Estimating. Salary £130 per annum.

Preference may be given to applicants who have passed the Examination of the Institution of Municipal and County Engineers.

Applications, stating age and experience, accompanied by copies of three recent testimonials, to be addressed to the undersigned not later than noon on Monday, December 14th.

H. GILBERT WHYATT, M.INST.C.E.,
Borough Engineer and Surveyor.

Municipal Buildings,
170 Victoria-street,
Grimsby.
November 30, 1914. (2,139)

TENDERS WANTED.

TEDDINGTON URBAN DISTRICT COUNCIL.

SEWAGE DISPOSAL WORKS.

The Council are prepared to receive Tenders for the Construction of Tanks, Channels, Filters, and other Works required in the Extension of their Sewage Disposal Works, Broom-road, Teddington.

The Drawings and Specification may be inspected at the Office of Mr. William Fairley, Consulting Engineer, Parliament Mansions, Westminster, also at the Office of Mr. Marshall Hainsworth, Surveyor, Public Offices, Teddington.

Copies of the Bill of Quantities may be obtained on deposit of crossed cheque for £5, made payable to the Council, which deposit will be returned on receipt of a bonâ-fide Tender.

Sealed Tenders are to be delivered to the undersigned by noon on the 21st day of December, 1914.

The Council do not bind themselves to accept the lowest or any Tenders.

(By order)
G. H. SALMONS,
Clerk to the Council.

Public Offices, Teddington.
November 30, 1914. (2,138)

UPTON-ON-SEVERN RURAL DISTRICT COUNCIL.

UPTON-ON-SEVERN WATER SUPPLY.

CONTRACT No. 2.

The Upton-on-Severn Rural District Council are prepared to receive Tenders for the Provision, Laying, and Jointing of about four and a-half miles of 5-in., 4-in., and 3-in. Cast-iron Water Mains, together with Valves, Hydrants, Air Valves, and necessary Chambers in connection therewith; also the Construction of Engine-house, Head Well, Reservoir, and other incidental Works in accordance with the Plans, General Conditions, and Specification prepared by the Engineers.

Plans and Specification may be seen at the Office of the Engineers, Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham, from whom copies of the Bills of Quantities and Form of Tender may be obtained on and after the 14th day of December on payment of a deposit of Five Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelopes supplied, and endorsed "Upton-on-Severn Water Supply Contract No. 2," to be delivered at my Office not later than 12 o'clock noon on the 31st day of December, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

G. H. T. FOSTER,
Solicitor and Notary,
Clerk to the Council.

Town Hall,
Upton-on-Severn.
November 25, 1914. (2,131)

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. DECEMBER 11, 1914. No. 1,195.

Minutes of Proceedings.

Municipal Water Supply.

The popularity of water uses who ever gave a single thought to the magnitude of the engineering difficulties that have to be overcome, the miles of culverts and pipes that have to be laid, or the vast areas that have to be searched for suitable sources of supply, in order that the domestic tap may not fail them, must be exceedingly small. And yet if such matters can be made interesting to the popular mind, it is very desirable that some knowledge of the conditions under which this and other municipal services are secured should be brought home to the general body of the ratepayers. One way in which this can be done is by the delivery of lectures to local audiences by responsible officials as opportunity may occur. Such a lecture on "The Provision of a Municipal Water Service" was recently given at Bolton by Mr. Lewis Mitchell, M.INST.C.E., the corporation waterworks engineer, by whose courtesy we are enabled to reproduce it in our columns. Part of the instalment which appears in our present issue is of historical interest, but the main body of the lecture deals in order with all those matters which arise for consideration in the execution of a scheme from its inception to the delivery of water to the householder. In the first place it is noteworthy that the day of the private company is declining, the principle being more and more generally acknowledged that a matter of such importance to a community as the purveying of water should not be left in private hands, but should be undertaken by the responsible municipal authority of a town or district. Evidence of this is found in the fact that at the present day the value of municipal water undertakings in this country alone approaches the colossal sum of £200,000,000.

In embarking upon a water scheme, the first question to be considered by a local authority is naturally the quantity of water that will be required—usually expressed in gallons per head of the population per day. This is a matter of some nicety, depending principally on the character and habits of the population and the industries of the district; nevertheless it is of primary importance, as it governs every future detail of the works. In this connection Mr. Mitchell points out that regard should be had to the future, and that as sanitary principles become better understood and the luxury of a good supply is increasingly appreciated, the demand will become correspondingly greater. The next important consideration is the quality or character of the water. It must be of good appearance, of the required degree of hardness, and free from contamination. And here it must be remembered that—to paraphrase an old proverb—all is not pure that sparkles, as the purity required is not only the natural and chemical, but bacteriological. Dealing next with the sources of supply, Mr. Mitchell gave separate consideration to underground supplies and impounding reservoirs. Both sources are, of course, entirely dependent upon the available rainfall. The actual rainfall in different districts in the British Isles may vary between the 20 in. of the Eastern counties and the 130 in. of the hills of Cumberland, while there is also great variation in the proportion of the actual rainfall which is available for use. If the geological conditions are favourable for obtaining an underground supply the task of the engineer may be a comparatively simple one. The initial cost will be comparatively small, treatment of the water will generally be unnecessary, no compensation water will have to be provided, and if the infiltration of surface water from thickly populated districts can be prevented the risk of pollution will be remote. The absence of liability to provide compensation water is due to the fact that no legal right to water which flows underground in an undefined channel can be acquired by prescription. The leading case on the subject was decided as long ago as 1859, but its authority was recognised by the House of Lords as recently as 1895, when it was held in the case of the *Bradford Corporation* v. *Pickles* that the defendant was entitled to divert or impound the water percolating beneath the surface of his lands, so as to prevent it reaching or assisting to feed the springs belonging to the corporation.

* * *

Street Accidents and Local Authorities.

The recent case of *Papworth* v. *Battersea Borough Council*, a report of which appeared in our issue of the 6th ult., p. 550—is an important one for highway authorities, and the result of the new trial which has been ordered by the Court of Appeal will be awaited with interest. The plaintiff was a lady cyclist, who had been injured through colliding with a surface gully. The council were both highway authority and sewer authority, and Mr. Justice Horridge held that, though no liability attached to them in the former capacity, they were liable in the latter. The Court of Appeal, without either affirming or reversing the decision on the question of law, came to the conclusion that several material questions of fact had been left in doubt at the trial of the action, and directed that there should be a new trial. The case being thus still *sub judice*, we defer further comment upon it until the ultimate result is made known. It may be of interest, however, to refer to one or two reported cases in which highway authorities, also acting in some other capacity, have been held liable for some negligent omission occasioning injury to persons

[illegible] authority, employed a contractor to construct a [illegible] surveyor. Some months later a subsidence took [illegible] horse fell and was injured. It was held that there was evidence that the work had been negligently [illegible] the highway authority.

[illegible] In *Blackburn* v. *Fylde Rural District Council* (1910) [illegible] 451). In that case the plaintiff fell and was injured [illegible] ing, but the box belonged to the board. It was held that, although the board might not as sur- [illegible] keeping the flap in a proper state, they were liable as the authority for watering the streets, in which capacity they had placed the flap there. In [illegible] a water-main valve cover projecting an inch above the road (*Kent* v. *Worthing Local Board*, 10 Q.B.D., 118). The board were both highway and water authority. The cover had been properly con- [illegible] It was held that it was the duty of the board to [illegible] using the highway, and that they were liable for the accident. Of course, in order to succeed in [illegible] the defendants are responsible.

Practical Points in Housing.

[illegible] arise for consideration in regard to the housing of the working classes may broadly be divided into those which concern policy and those which are connected [illegible] Mr. [illegible] and Mr. [illegible] meeting of the Institution of Municipal Engineers lay in the very useful suggestions he was able to [illegible] the repair or reconstruction of old houses which have become unfit for human habitation and as [illegible] part of his paper was, in our view, open to certain criticisms, which, however, were not forthcoming [illegible] attributed the present deficiency in housing accommodation primarily to the absence of any [illegible] dwellings which may become unfit for human habitation without having recourse to judicial proceedings. In so far as this was an effective cause of the deficiency, it was removed by the Housing, Town Planning, &c., Act, 1909, by which a local authority are themselves empowered to make closing orders, subject to an appeal to the Local Government Board. The difficulty has really arisen from the growing impossibility of erecting cottages at a cost so low that they can be let at an economic rent. It will be seen at once that the greater the facilities for making closing and demolition orders, the greater will be the deficiency of accommodation, unless the principle of state or rate aid is admitted—unless, indeed, the [illegible] an increased rental. These, however, are questions of politics with which we have no concern.

Turning now to Mr. Whitwell's suggested minimum requirements where houses are being reconstructed, we find ourselves in general agreement with what he had to say. It must be remembered, however, that the powers of a local authority under the Act of 1909 are limited to requiring the execution of works which are "necessary to make the house in all respects reasonably fit for human habitation," and that a landlord has a right of appeal to the Local Government Board if he is aggrieved by the terms of the notice. We agree that it is important to avoid patching up dwellings that are inherently [illegible] Such houses should undoubtedly be closed and demolished. But in specifying works to be executed local authorities should be careful not to exceed the powers fairly given to them by the statute. Proceeding to deal with the question of the provision of new cottages, Mr. Whitwell boldly expressed the opinion that "good, serviceable and attractive workmen's houses can be erected under the present Housing Acts, embodying the best features of modern garden city dwellings, having environments both pleasing and practicable in character, and capable of being let at a rental quite within reach of those people for whom they are intended." The discussion showed a disposition to disagree with this opinion—a disagreement which we entirely share, regarding it as too broad a generalisation based without justification on the experience of Mr. Whitwell in his own district.

Sewage Treatment by Aëration.

[illegible] an issue of July 24th last [illegible] these columns with the results which had been obtained in experiments carried [illegible] Messrs. Ardern & Lockett in the purification of sewage by aëration without [illegible] interesting feature of this process was the good effect produced by the continual mixing with the sewage under treatment of the sludge which had accumulated as the result of the sedimentation of the [illegible] led to its description by the authors of the experiments as "activated" sludge. We then ex- [illegible] further experiments on a scale considerably greater than laboratory experiments were needed in order to demonstrate that the same results could be secured when dealing with large volumes, and to prove that the cost of the process would not be prohibitive. It is therefore with considerable satisfaction that we note from the paper, printed on another page, which was read by Mr. W. H. Duckworth, F.C.S., manager of the sewage works at Salford, before a recent Manchester District meeting of the Association of Managers of Sewage Disposal Works, that highly satisfactory results were obtained in similar experiments on a practical scale carried out at the Salford sewage works. These results indicate that the principle has been proved, and [illegible] was undertaken, the author and his co-worker are to be congratulated on their success.

There still remains the question of cost, in some respects the most important side of the question from the engineering point of view. In this connection the remarks of the author towards the end of the paper are wise and deserve careful

consideration. It is much better to avoid publishing figures based upon results obtained with apparatus which was not designed specially for the purpose in view, and the efforts of engineers, chemists and sewage works managers should now be devoted to ascertaining which form of tank and method of air distribution is the most efficient for the process in question, and what is the minimum volume and pressure of air required to produce the maximum degree of purification. A further paper on this subject was read by Mr Ardern at the annual general meeting of the same association held in London yesterday afternoon, and will be reproduced in our issue of next week, together with an account of the discussion which followed its presentation.

Country Roads in Victoria. In another column will be found a summary of the first annual report of the Country Roads Board of Victoria, Australia, a document of exceptional interest. The amount of constructional work carried out by the board since its appointment in March of last year is naturally comparatively small, but much preliminary work has been done in connection with a systematic investigation of the highways in some of the more remote districts. The commercial and economic value to any community of a system of good roads is now generally recognised, and the disabilities under which a population is placed in their absence were strikingly represented to the investigators both by the interest which their proceedings aroused during the day and the deputations which they received at night to urge the necessity for some action. The report states that the condition of the roads in the areas inspected is anything but satisfactory, while in the older settled districts there are distinct signs of deterioration in recent years. In regard to the carrying out of permanent improvements, the board has decided upon a policy of delay until some assurance is forthcoming that the locations and grades of existing roads cannot be improved at a reasonable cost. The effects of modern traffic, too, are just beginning to be felt in Australia, a fact which raises important questions as to the choice of materials. This matter is still under consideration, although, having regard to the immense mileage of roads awaiting construction in the country, the choice of materials must be limited for many years to come to broken stone or gravel. It is interesting to observe that the Melbourne University authorities are co-operating with the board in regard to the testing of materials, and the assistance so rendered ought to be of great value.

* * *

"The Surveyor" Special Issue. In the Special Annual Issue of The Surveyor, to be published on January 29th next, the customary comprehensive list of the works projected by the various local authorities for 1915 will, as usual, be preceded by a series of articles contributed by specialists reviewing the progress which has taken place during the past year in connection with sewerage and sewage disposal, road work, water supply, refuse disposal, street lighting, electricity supply, bridge construction and the provision of public buildings. The legal precedents and legislation of 1914 in relation to municipal engineering will be reviewed by the Law Editor, Mr. J. B. Reignier Conder, while another valuable feature of the issue will be a survey of the year's literature of municipal engineering. In addition there will be the customary Law Notes, Reports of Municipal Work in Progress, Local Government Board Inquiries, Personal News, and the fullest information relating to Vacant Appointments, Municipal Contracts and Competitions.

As stated in our last issue, those of our readers who propose to comply with our request for particulars of works projected in their districts will greatly oblige us and facilitate the production of the Special Number by forwarding their returns without delay. The form which these should take is now generally understood, but the exact nature of the information sought can be seen by reference to our issue of January 30th last, over thirty-six pages of which were devoted to the publication of these official forecasts. We would repeat also that any other material which readers may consider sufficiently interesting for inclusion in the issue will be welcomed, and that this matter also, particularly if its use involves the reproduction of drawings or photographs, should likewise reach us at the earliest possible moment.

* * *

The Llanybyther Appointment. The Llanybyther Rural District Council, who resolved to advertise for a surveyor at £45 a year under conditions described recently in The Surveyor, have completed their task by making an appointment, but it can hardly be claimed that the last stage of the proceedings was happier or less open to question than the first. The subject led to what the reporter of the *Cambrian News* designates "a lively discussion." In the course of the voting the chairman, Mr. Rees E. Evans, observed that one of the candidates had been rejected, though he had the support of the majority, and he added, "the system is rotten, and as chairman I am not going to proceed further with it. We must vote over again." After an interval of oratorical fencing the chairman was at length prevailed upon to proceed under what he repeatedly denounced as a rotten system, and upon a vote being taken it appeared that the two candidates for the appointment received ten votes each. The chairman then gave his casting vote for one of them, remarking that "the other candidate had not asked for his support." Dispassionate observers would be excused if they concluded that this might be a very good reason why he should have supported the unsuccessful candidate, but this consideration is negligible in face of the overshadowing doubt whether the worthy councillors have legally appointed anybody at all. It is true that this would not really matter a great deal in view of the value of the position, but even the business in connection with a salary of £45 a year ought to be transacted "decently and in order."

* * *

Institution of Water Engineers. Although this year the proceedings of the winter general meeting of this body—which opens this afternoon at the apartments of the Geological Society, Burlington House—are to be spread over two days, only two papers are, as it happens, to come before the members for discussion. In one of the two contributions an account of the scraping of a 15-in. trunk main at Batley will be supplied by Mr. J. C. Barrowclough, the waterworks engineer of that town, and in the other the Whitton pumping station of the Ipswich Corporation waterworks will be described by Mr. C. W. S. Oldham. It cannot be denied that this is an unusually meagre programme when contrasted with those of previous winter meetings, for there would seem to be little other business to transact; but the responsibilities of water engineers, like those of other officials in charge of public services, have been in no way lessened by the war, so that, while the apparent dearth of papers is to be regretted, there is some cause for congratulation that the fixture has not suffered the fate that has overtaken so many similar gatherings during the past few months.

Highways and Byways.

By W. GREGORY, A.M.I.C.E., M.INST.M.E., District Surveyor, Herts.

Good roads are an asset of inestimable value, and their construction and upkeep should be a national charge, both on account of uniformity in construction and administration.

The definition "good" is ambiguous, a good road in one district, or under certain conditions, being a very inferior one in another, or under other conditions; consequently uniformity of construction and maintenance would hardly be expected to be found.

A road should be constructed to carry the heaviest traffic likely to come upon it under all conditions, with as little wear to the road itself, and the greatest amount of comfort for those travelling over it as possible; and for this it is not absolutely necessary to make all roads to the same pattern; varying conditions of climate and of life—mining, agricultural, or manufacturing—call for somewhat different methods of treatment.

In olden times roads in winter were partly impassable, and only the old Roman, or later turnpikes, were used with any degree of comfort.

After the invention of the steam engine and the construction of railways, roads appear to have become neglected, and from 1830 to 1880, a period of fifty years, very little was done in improving them. Creasy, writing in 1847, says: "Railroads have now superseded in a great measure the use of the old turnpike roads, and probably ere long there will not be traffic enough to contribute the toll for their maintenance; we may then anticipate that they will fall into the condition of parish roads, and become again impassable if the Legislature does not provide for the contrary. The next generation will almost require a guide-post at every turning to indicate the route."

There is no doubt that the introduction of the bicycle had a large share in the general desire for improved road surfaces and the calling into existence of steam rollers for consolidating roads.

The writer distinctly remembers being thrown from a bicycle on a trunk road between Cheltenham and Worcester in the month of August, 1880, by reason of the deep ruts on the road, an almost impossible occurrence at the present time.

The invention of the internal combustion engine and its application to motor cars quickly forced the matter of road construction into the front rank of important questions.

Roads inside the boundaries of urban, borough, or city authorities require separate dealing with to those which are distinctly rural.

Considering a road as having a fairly smooth surface, whether steam rolled or not, the wear on the surface is caused by the following:—

(1) The pounding action of the horses' hoofs.

(2) The grinding of tyres of wheels.

(3) The sucking action of the rubber motor tyre on recovering its shape (from the flattening out by the weight of the car) in its revolution.

(4) The effect of the strong current of air produced by the body of the car, which partly carries away the disintegrations.

(5) The nipping, sucking, and grinding action of steel-studded motor tyres.

(6) The grinding action of diagonal ribbed tyres of traction engines.

(7) The disintegration of portions of metal by reason of changes of temperature, and expansion of water in freezing.

Other causes which tend to accelerate any of the above are the corrugations or wavy effect produced through rolling in too thick a coat of metal in proportion to the gauge, the alterations of subsoil due to mining operations in some districts, and the neglect of farmers to clean the wheels of carts in agricultural districts in bad weather.

In the case of the last-mentioned the writer had to repair a 300-yd. length of a main road, so damaged that the steam-rolled granite surface and foundation of flint gravel were both licked up and carried away by the large lumps of clay brought on the road with the cartwheels during a fortnight of alternating frost and thaw, and the damage done amounted to £100, far in excess of motor car traffic.

Arguments have taken place as to the benefit or otherwise of trees growing alongside highways. On untarred roads they may, from their shade and shelter, prevent sudden changes in the condition of the surface, but there is no doubt that close proximity is detrimental, especially to roads having thin crusts, the growth of the roots loosening the subsoil and causing the crust to assume a wavy formation.

Whether a road was good or bad depended up to recent years to a large extent on the prevalence or otherwise of material locally obtainable, irrespective of the fact that the material might be totally unsuitable for the traffic.

There are many hundreds of miles of roads in the kingdom which were formerly only country lanes or cart tracks. These are now taking motor traffic, and in many places are not wide enough for two vehicles to pass. As any public road may be called upon to carry this traffic in the future, these should all be widened sufficiently to allow two cars to pass at a fairly fast pace, besides allowing a margin for the safety of the pedestrian.

To make all the roads of the country of a given class of an uniform thickness is not necessary, as the strength depends not only on the thickness and quality of material, but also on the nature and condition of the subsoil, and the support that is given by the haunches or abutments of the crust; a road passing over a chalky subsoil will carry a much heavier load for the same thickness than one over clay or loam.

One such road constructed by the writer, having only 2 in. of flint gravel, topped by 2 in. of granite, rolled tight, carried for ten years most of the traffic from about 20 square miles before the surface wore sufficiently to call for repair, the subsoil being kept dry by the close surface, and sufficient side drains, 8 ft. from the metal bed, carrying off the drainage. The same road, if constructed entirely of local flint gravel (the cheapest in first cost), would have required remetalling every second year, the cost, comparing the two, being 30s. for gravel as against 13s. for granite, and less labour being required on the granite surface.

Many road surfaces have too much camber, making it unsafe and uncomfortable for fast traffic, which, in such cases, invariably keeps to the centre.

Weak roads may be strengthened by dwarf side walls of rubble stone sunk at the sides, which may also act as drains for the subsoil.

Sudden dips between the metal surface and the margin of a road are sources of weakness, and where possible should be filled up and rolled solid to an even slope with the rest of the road section, and provision made by outlets to side ditches or drains at some distance from the metal bed. This, in many cases, is impossible without going to large outlay in purchase of land; but a substitute may be found in deep subsoil drain constructed to take surface water as well.

There is not the slightest doubt that tarring a road surface minimises the wear; at the same time it must be remembered that the tarring of the sur-

tave or facing with asphaltic crust prevents evaporation.

Very few roads are properly drained—some not at all. During rainfall a larger percentage of water runs off the surface of a road than off the land; but if untarred, a considerable amount soaks through it, and is given off again partly by evaporation. In many cases a portion of the rainfall on adjacent land finds its way sideways below the road crust, and escapes by evaporation through the crust; but if the road is tarred this is prevented, and if no provision by drainage is made, a source of weakness to the crust is produced.

No doubt the vision in the mind of the average motorist is that one showing the whole of the public roads of the country surfaced with an asphaltic crust. This is a desirable objective, but under present conditions it is prohibitive except on short lengths of important trunk roads, for, taking the average width of roads at 16 ft., the cost would have to be less than £2,000 per mile for a thickness of 3 in., and more according to the distance from railway. This is assuming that there is a fair crust to work on; but most secondary roads require making up and draining before this takes place, and as very few have foundations, the present surfaces would, in many cases, require to be used as such, and future roads built on them.

Substitutes—as tar-grouting or tarred slag macadam—will no doubt bring the dream nearer to a realisation.

The writer, in 1903, laid down a length of slag which was dry rolled on a scarified surface, and cold coal tar poured on and brushed into it, and rolled with the addition of granite chippings and sand until a firm surface was obtained. This has lasted, carrying considerable motor traffic, until the present time with but little repair in the shape of slight painting in places with hot tar and chippings, and is practically as good as when laid.

Much may be done on roads to improve the gradients—cutting down snaps of hills and filling hollows, and increasing the efficiency without detracting from the picturesqueness of the surroundings.

All cross roads where view is restricted owing to high banks, coppices, &c., should have the corners rounded off and set back, so that a minimum width diagonally of four times the width of the road is left for traffic—*i.e.*, supposing the roads to be 15 ft. in width, an open space at the cross-roads should be 60 ft. from curve to curve diagonally.

The question of labour will come to the front in all future highway administration, and higher wages and provision for housing will have to be considered in order to get skilled, intelligent men, without which economy in construction and upkeep will be impossible.

Metropolitan Water Board New Offices. At a special meeting of the Metropolitan Water Board recently the tender of Messrs. T. W. Heath & Son, amounting to £110,004, was accepted for the erection of the board's new central offices in Rosebery-avenue.

Water Main Cleaning.—The "Eric" (Patent) Pipe Scraper Company, Limited, Chepstow, Mon., have issued an illustrated booklet describing their well-known system of cleaning water mains. Engineers in search of an effective means of dealing with the trouble [illegible] will find it well to apply for a copy of the pamphlet which will be sent free on application to the [illegible].

Architects' War Committee: Exhibition of Drawings. An exhibition of drawings, forming part of the London Section of Prof. Geddes' Collection will be opened at the R.I.B.A. Galleries on Tuesday, December 15th, at 4 p.m. These drawings have been prepared and collected in order to replace a portion of Prof. Geddes' collection lost by the sinking of the "Clan Grant." Mr. H. V. Lanchester, vice-president R.I.B.A., will give a brief paper on "Civic Survey Work," illustrated by these drawings, on Thursday, December 17th, at 8 o'clock. The exhibition will remain open till December 19th.

THE RUISLIP-NORTHWOOD TOWN PLANNING SCHEME.

Papers dealing with certain features of the town planning scheme of the Ruislip-Northwood Urban District Council were presented at a meeting of the Town Planning Institute held at Westminster on Friday evening last, the authors being Mr. F. M. Elgood, chairman, and Mr. Edmund R. Abbott, clerk, respectively, of the local authority. Mr. Raymond Unwin occupied the chair, and among those present were Messrs. W. R. Davidge, district surveyor, Lewisham, C. J. Jenkin, engineer and surveyor, Finchley, W. T. Lancashire, city engineer, Leeds, J. Walker Smith, chief engineer to the Local Government Board for Scotland, and E. Willis, engineer and surveyor, Chiswick.

Mr. W. L. Carr, who opened the discussion, remarked that it had been one of the greatest pleasures in his life to assist in the carrying out of the scheme. At the outset he confessed they got very disheartened, but the advice which they had received from time to time from the late Alderman Thompson seemed to take them right out of the mire, and everything became plain sailing. It was a wonderful fillip to them to be able to turn to one whose experience of town planning in its early stages was so valuable, and it was astonishing what could be done with a town planning scheme if one only stuck to it. He was quite confident, so far as his own authority was concerned, that they had secured enormous advantages of many kinds which even at the present time they were feeling the benefit of, and his belief was that every penny of expense incurred in the preparation of their scheme would be repaid a hundredfold to the community. It was his hope that surveyors in other districts might be induced by the example of Ruislip-Northwood to try to promote schemes where they felt the localities would benefit from such a course, and not take up the attitude that some had done, and say that it only meant more work and very little compensation for their trouble.

Mr. J. Walker Smith, who also spoke, asked by what process of reasoning the Ruislip-Northwood Council had adopted the mathematical square of a 5-acre land unit because it seemed to him that complications were likely to arise when this embraced parts of other properties, streams, and so forth. They were doing a little town planning in Scotland, and there was one scheme of interest to him in connection with the city of Glasgow. That scheme embraced a number of districts, and would extend to some 20,000 acres, more or less. The main feature of it was the continuation from the centre of the city of an existing main road, a wide thoroughfare of rather fine appearance, which it was proposed ultimately to extend a distance of 20 miles to Loch Lomond.

Municipal Work at Stockport. A total length of 1,085 yds. of new streets and 9 ft. passages was opened out in Stockport during the period covered by the last-issued annual report of Mr. John Atkinson, Assoc.M. Inst.C.E., the borough surveyor. Highway expenditure during the year amounted to £36,292. The carriageways are principally composed of Lancashire and Derbyshire grit setts, with Welsh and Dalbeattie granite setts on the important thoroughfares and main roads. On the main roads, however, the grit paving is gradually being done away with, and granite paving and granited rock asphalt laid down instead. The macadamised roads in the borough are not of great extent. In connection with lighting, Mr. Atkinson's report states that 3,185 gas lamps are now in use, these being erected at an average distance apart of about 55 yds. The practice within recent years, however, has been to place the lamps an average distance of only 40 yds. from one another. All the lamps have incandescent burners. The Gas Committee charge per annum for lighting, gas and maintaining (1) "ordinary" lamps, £2 10s. for one jet, and £5 14s. for two jet; (2) "globe" lamps, £3 7s. for one jet, £5 5s. for two jet; and £7 for three jet. There are sixty-five electric arc lamps. The average cost of fixing arc lamps on tramway poles is £18. The annual lighting, cleaning and maintenance charge per arc lamp is £11 5s. There are sixteen "Osram" lamps, the average cost of fixing being £3 per lamp, and the annual charge for lighting £2 per lamp.

Housing of the Working Classes: A Few Suggestions.*

By Edward Whitwell, [illegible]

[illegible] the [illegible] of the [illegible] the [illegible] [illegible] the [illegible] [illegible] [illegible]

[illegible] faced with the prospect of large [illegible] housing schemes, and of having to [illegible] the demands for water, [illegible] had [illegible] to supply.

Since the awakening of authorities concerning housing schemes is very much on the increase, it would be well, seeing that all work has to be executed under the same Acts, to some definite lines were agreed upon and adopted with a view to placing all new houses as far beyond the possibility of slumdom as means and circumstances would allow, and if a real attempt were made to achieve the ideal instead of the usual tendency to anticipate the realisation of the oft-repeated story of wonderful five or six roomed workmen's houses, with all appurtenances, &c., at £100 or less (said to be possible by some would-be housing expert), better housing would result. It is really astonishing how regularly the £100-house story appears and the credence which is given to it by intellectual men, a fable which the author anticipates will soon be relegated to Andersen's or Grimm's [illegible] Such [illegible] may have been [illegible] or three decades ago; to-day they are as remote as the Millennium.

Now the author considers an excellent lead to authorities has been given by the promoters of several of the garden village schemes, and he is of the opinion that good, serviceable and attractive workmen's houses can be erected under the present Housing Acts embodying the best features of modern garden city dwellings, having environments both pleasing and practicable in character, and capable of being let at a rental quite within reach of those people for whom they are intended. If all local authorities would but realise this instead of laboriously copying the speculative builder, their schemes would be more likely to meet with public approbation than is the case at the present time.

Consider what should be embraced by a suitable scheme under the Housing Acts. In the first place every effort should be made to prevent the new being contiguous to the old. The higher-lying ground should be selected in preference to the lower, and if in a valley having steep sides, such as are peculiar to Wales, let the site be on the northern side.

The number of houses to an acre should not exceed twelve, and in a block four. When the latter is effected it is unnecessary to construct back streets, which, of course, account for a considerable expense. Complete privacy should be secured for every house (1) by arranging that the external doors are as far apart as possible, and (2) by erecting a short wall between every house at the rear, so that operations may be carried on at the rear of the dwellings without being casually observable from the house adjoining.

Rooms.—Vary the number of rooms per house, and provide a parlour, if possible, which can be used as an auxiliary bedroom. In a recent inspection of the houses he had erected without parlours, the author found that no less than 70 per cent of the tenants were living in the scullery, they having converted their large living-rooms into parlours.

Windows.—None should be less than one-sixth the floor area, and all should be made to open; the ordinary sash windows are much more serviceable and satisfactory than the casement.

Drains.—The branch drains to the main branch should be as short as possible, and intercepting traps should be avoided, and ventilation pipes always carried up above the main roof.

Ashbins.—Provide every house with a covered portable ashbin, and renew when necessary. It is the [illegible] in this department.

Bath, &c.—Provide every house, however small, with a [illegible] ground floor. Of course, a bath means hot water, [illegible] of a simple combination arrangement. For the houses in South Wales, where hot water is required for the miner's daily bath, the author found the "Model Cottager" to be an excellent contrivance.

Cupboards.—Provide at least one cupboard upstairs and two downstairs, in each case reaching from the floor to the ceiling.

Back Entrances.—These [illegible] be permissible unless kept less in width than one-third of the frontage, and in depth less than one-third of the depth, of the main building.

Generally.—Other matters of construction are largely a question of taste or by-laws.

Regarding the appearance, disposition and environment of the houses, it is here that the least attention is given and here that the most is needed. Vary, as far as reasonable, both the distance from the street and external treatment of the blocks in order to avoid that monotony so common to the work of speculative builders. Don't forget that the backs of the houses always form an elevation from some point, and generally deserve as much consideration as the front. Avoid the stereotyped brick forecourt walls and rails, and plant instead suitable privets, and, in order to give some encouragement to the incoming tenants, plant a few shrubs in the privet encircled forecourt. In all the spaces between the blocks plant a larger tree of the evergreen type, so as to break to the eye the continuity of the blocks. Where larger spaces occur rail these in and plant with suitable shrubs, and, along with spaces between blocks, reserve for attention by the authority. Don't forget the children, and if you cannot provide a large open space in the middle of your colony of houses which can be viewed from every house provide one somewhere else; but provide it. Lastly, provide sufficient ground for vegetable growing by the tenants, either in connection with the houses or in the form of allotments contiguous to their dwellings.

BALANCE SHEET.

Receipts.	£	s.	d.
From rents—			
12 houses at 5s. 6d.	1,758	18	0
11 houses at 18. 9d.	160	11	0
	1,919	9	0
Less 5 per cent for empties	95	19	0
	£1,823	9	0

Expenditure.	£	s.	d.
Repayment of loan, principal and interest without deduction of income tax at [illegible] per cent—			
A. In respect of land, £2,201 for [illegible] years ...	[illegible]	[illegible]	[illegible]
B. In respect of buildings, £21,664 for 60 years ...	[illegible]	[illegible]	[illegible]
C. In respect of sewers and water for 30 years ...			
D. In respect of street works, £1,[illegible] for 20 years	[illegible]	[illegible]	[illegible]
Rates, 1,3 at £8, less [illegible] per cent G.D.R. rates, [illegible] at £7, less [illegible] per cent G.D.R.	[illegible]	[illegible]	[illegible]
Rates, 12 at £8, less 30 per cent P.R. rates, 1 at £7 less 30 per cent P.R.	[illegible]	[illegible]	[illegible]
Insurance, average for 7 years	14	[illegible]	[illegible]
Empty and water rates, 12 at 24s., 1 at 22s. 6d.	1[illegible]	2	[illegible]
Allowance for repairs, £1 per house ...	[illegible]	0	0
Supervision and collection at 4 per cent (actual cost)	7[illegible]	[illegible]	[illegible]
Balance	[illegible]	[illegible]	[illegible]
	£1,8[illegible]	[illegible]	[illegible]

The author has recently carried out a scheme of 136 dwellings of a small type which embodies all the foregoing features, and as the balance-sheet he provided to the Local Government Board gives some indication of what was done, and may be of interest, it is appended.

In concluding, the author expresses the hope that his views may be freely discussed, and that from the discussion may emanate other definite views which will attract the attention of those on whom the responsibility chiefly rests, so that the stigma of unhealthy dwellings and gloomy environments so inherent to the English town may soon become simply a memory.

DISCUSSION OF MR. WHITWELL'S PAPER.

Mr. W. L. CARR (Ruislip-Northwood), in proposing a vote of thanks to the author of the paper, said he was with Mr. Whitwell in thinking that a definite code of minimum requirements should be prepared by every authority, and that to this code all properties which were being improved or reconstructed under the Housing Acts should conform. It was a matter that should be carefully considered by surveyors in every part of the country. Mr. Whitwell had laid down certain requirements with regard to convenience, and he (the speaker) might point out that clause 59 of the Ruislip-Northwood scheme secured what he

varied in that connection, thus providing that every dwelling should have a separate convenience. He was in agreement with the author on the subject of air space, but he did not agree that rooms should have a minimum height of 8 ft. His own scheme allowed a height of 7 ft. for living-rooms and 6 ft. 6 in. for bedrooms. So long as the windows went to the ceiling the same result was secured, as the space above the windows simply meant the accumulation of so much vitiated atmosphere. They had to fight very hard for the clause, but they were successful in the end, and it did undoubtedly get over the question of having rooms less than 8 ft. in height, besides admitting of a saving in cost of construction. It was necessary, he thought, that every house should have a store for food. They had made that provision, and would be able to enforce it in the future. He would like to ask the question whether a local authority, after building houses, could sell the buildings to tenants who might desire to acquire them. His own view was that there was no objection to houses being built in blocks of eight provided they were built round quadrangles, as in the Ruislip-Northwood scheme. He was opposed to the erection of walls at the rear of houses, because walls, however low they might be, prevented the free circulation of air. In regard to the matter of curtilage, he would like to know whether Mr. Whitwell had provided for not more than a quarter of the land being built upon. He did not agree with the author on the question of intercepting traps; he thought himself these should not be abolished in hilly districts, though he did on the flat. He agreed with Mr. Whitwell regarding back additions. In conclusion he desired to ask why, in the balance sheet accompanying the paper, there was no price given in respect of sewers.

Mr. A. Patmer (London) said he considered it would be better to draw up a code of regulations applicable to every district, the restrictions in various parts of the country differing so greatly. In Cornwall, for example, it was a common thing to use local stone for walls, which were frequently as much as 3 ft. in thickness; but the regulations in vogue there obviously could not apply to a county like Surrey, where the thickness of brick walls was 9 in. He doubted whether the figure of one-sixth of the floor area as the window space could be generally applied. In the North the result would be very cold rooms, proving that it was difficult to have the same code in all parts of the country.

Mr. G. B. Chilvers (Dundee) agreed that a good, well-ventilated pantry should be provided in all working-class dwellings. Unfortunately, they could not give people all they asked for. In his own district there were not many people who could pay as much as 4s. 9d. and 5s. 6d. a week in rent.

Mr. A. R. Bleazard (Chitheroe) said they had tried in his district to put twenty houses to the acre, but afterwards found that they could not let them for less than 7s. 9d. and 6s. 9d. per week. He then got tenders for forty to the acre, which were let at 5s. 9d. and 5s. 6d.; therefore they could not do what Mr. Whitwell was doing. Much depended, of course, on what was called a house; in his better houses he provided a parlour, three bedrooms, kitchen-scullery, and bath-room. Twelve houses to the acre was a good thing if it could be done, but he would like to find a place in the North where comfortable houses had been erected on that system and let at such low rents.

Mr. H. C. Adams (London) asked Mr. Whitwell whether, if he lived in the old part of a town with old sewers, he would have an intercepting trap on the drains of his own house.

Mr. T. Mundy (Woolwich) inquired whether, in miners' cottages, baths, if provided, were not often used for the storage of coal, and seldom for their legitimate purpose.

Mr. W. Wallin (Newcastle-on-Tyne) suggested that the paper verged somewhat on the millennium. He agreed that locality had a great deal to do with the class of houses which were put up. If Mr. Whitwell had actually been able to do what he had said, South Wales was in some respects ahead of Northumberland, for he had found that where baths were provided in pitmen's houses in the latter county, the men, in 75 per cent of cases, continued to bathe in front of the fire, and the baths were used for every other purpose except the one for which they were intended. Temperament entered largely into the question. He agreed that slums should be done away with, but one could build the nicest houses possible, but occupied by a certain class of people they would be like pigstyes in three months. It was impossible for a workman earning only 15s. a week to pay 5s. 6d. a week in rent; therefore they had to find some cheap way out, and if Mr. Whitwell would furnish a plan of what he had done it would be very helpful.

Mr. Horace Boot (Westminster and Tunbridge Wells) asked Mr. Whitwell whether he had actually built the houses he had described. If he had he would like to hear what his experience had been, because he could not see how such houses could be built at the price. He admitted there was a crying need for such dwellings, but it would be interesting to know whether the houses could be made to pay. He knew of no cottages in the South which had been built at anything like the figure he had given. There were three reasons why the cost of house building had increased in recent years. The first was that the men were paid more than formerly; secondly, they did less work; and, thirdly, materials cost more; so that, although years ago it might have been possible to have done what was suggested in the paper, he ventured to think he would find it was impossible now.

Mr. Whitwell, in replying, observed, in regard to Mr. Carr's remarks, that 7 ft. was a very low height for a room, and he would not like to cut it down to that figure in order to save a few shillings. He did not think anyone would agree that houses should be built without stores for food. Houses built under the Housing of the Working Classes Act could not be sold to tenants. He disagreed with what had been said regarding dividing walls, and would not dream of omitting to provide such means of securing necessary privacy. His houses averaged in number 13·8 to the acre, and they were so arranged that practically in every case the living-rooms looked out upon open spaces. The cost of the sewers was included in the street works contract, owing to a Local Government Board requirement, and a 50 per cent reduction that was allowed for compounding rates on houses of £10 and under per annum also helped to reduce the cost to the tenant. He had not suggested that one code could be made applicable to the whole of the country; what he had in view was a code of minimum requirements which could be increased as circumstances demanded. One must not go below a reasonable health limit. A less window space than one-sixth of the floor area was too small. In regard to cost, he agreed that it all depended on wages and so forth, and he realised that it would not be possible to build such houses in the South of England and let them at the same rent. In reply to Mr. Adams, he would have no objection to living in a house without an intercepting trap, provided every house had its own ventilator direct into the sewer. In his district they had not had the same experience of the misuse of baths in miners' houses, because they had managed to persuade the Local Government Board to allow baths to be fitted within 4 ft. of the fireplaces. The houses he had described had been erected about two years, and they found they were quite within their estimates. At the same time, it was a question of district, and the same thing might not be possible elsewhere.

Change of Address.—Increasing business has, we are informed, made it necessary for Durable Roads, Limited, to move to more convenient offices. Their address is now 35 Hamilton House, Bishopsgate, E.C., and their telephone number London Wall 3416.

Business Announcement.—Messrs. J. Wolstenholme & Son, mechanical and electrical engineers, Albert Iron and Brass Works, Radcliffe, Lancs, announce that they have appointed Messrs. W. E. Horsman & Son, of 127 Pendle-road, Streatham, London, S.W., their sole agents for the counties of Kent, Surrey, Sussex, Hampshire, Buckingham, Middlesex and Essex.

Salford Electricity Undertaking.—The new turbine-driven electric generator which was lately installed at the Frederick-road electricity works (Pendleton) of the Salford Corporation was formally started last week by the Mayor of the borough. The new installation is part of the policy of improvement which the Salford Electricity Committee has undertaken since the appointment of the new engineer, Mr. J. A. Robertson. This set has cost about £15,000, and was delivered and completed in nineteen weeks by the British Westinghouse Company.

Aëration Experiments with Activated Sludge.

A RÉSUMÉ OF WORK DONE AT SALFORD.*

By W. H. DUCKWORTH, F.C.S., Manager, Sewage Works, Salford.

On April 3rd of this year a paper on "Experiments in the Oxidation of Sewage without the Aid of Filters" was read before the Manchester District of the Society of Chemical Industry by Messrs. Ardern & Lockett, of the Manchester sewage works laboratory at Davyhulme. This paper dealt with a series of experiments which had been carried out at Davyhulme, demonstrating the possibility of treating crude sewage by means of atmospheric air, and producing purification to the extent of over 90 per cent, thereby producing effluents which were considerably above the requirements of the Mersey and Irwell Joint Committee, as well as the suggested dissolved oxygen standard of the Royal Commission on Sewage Disposal.

The general laboratory experiments at Davyhulme were repeated at Salford on Salford sewage by Mr. S. E. Melling, F.I.C., the Cheshire county analyst, and chemist to the Salford River Conservancy Committee, the result being that the claims of the Manchester experiments were fully verified; and as we have a plant existing at the Salford sewage works which would enable us to translate these experiments on a fairly large scale, Mr. Melling and myself were instructed by our committee to test larger quantities of sewage, with results which, in our opinion, are entirely satisfactory.

The laboratory experiments consisted of drawing the air of the laboratory through a sample or samples of sewage by means of an ordinary Geissler pump for several weeks, allowing, at various times, the sewage to settle, decanting the more or less clarified liquid, recharging with another sample, and again resuming the drawing of air, this method continuing until the sludge accumulated to some 20-25 per cent of the bottle capacity. While with a small quantity of sludge indications were found of some purification, it was not until the above accumulation of about 20 per cent was obtained that good and reliable results were realised.

The plant already existing on our works suitable for the translation of the work to the larger scale is in our roughing filters. These occupy the site of two previously existing precipitation tanks, and are some 2,000 sq. yds. in area. They are filled to a depth of 2 ft. 6 in. with river gravel, and were designed to pass the whole of the tank effluent through after precipitation and sedimentation, prior to final filtration through the percolating filters. At the bottom of these roughing filters is a network of air pipes with ½-in. brass jets, each of the six filters (which are sub-divided into three) containing some 15,000 of these jets through which the air passes, and the whole were in daily use, not for aëration purposes, but as a cheap means of mechanically cleansing the filters when worked in conjunction with upward washing.

As the sum total of the method of treating sewage by "activated" sludge is agitation by means of atmospheric air, it will be readily understood that these beds required comparatively little alteration to fit them for the new process. The media of one section, or one-third of a filter, was removed, and a brick floor was built quite close to the aëration pipes so as to obviate, as far as possible, any stagnation of the sludge below the air jets. This section was again sub-divided into two, and we thus had a tank approximating 12,500 gallons.

The experiment in this tank was started on June 16th of this year, the tank receiving its first charge of crude sewage from the beginning of the detritus chamber, without chemicals, and air was passed through for several days, samples being taken every day for analysis. It was then allowed to settle, and the more or less clarified liquid was run away, and the tank received another charge, this method of an occasional charge obtaining until July 20th. On four occasions during this period 27 lb. of iron salt (a 10 per cent mixture of ferrous and ferric sulphates) was added to the sewage to form a nucleus for the sludge.

ANALYSES.

A series of analyses of the various crude sewages and effluents were carried out, and gave an indication of how the experiment was proceeding in its initial stages. As our first object was to get an accumulation of sludge in an "activated" condition, we decided to accelerate this by washing some humus which had been taken from the final effluent culvert free from heavy sandy detritus, and putting these washings into the tank. This was accomplished on July 20th and 21st, and the accumulation of sludge and water to a depth of 14 in. or 15 in. was agitated without the addition of any more sewage by means of air-blowing from this date until August 13th. On August 14th the fillings were recommenced, and samples were again taken at various times and analysed, the average of these analyses being given below.

A study of these results will show that after about two months we were approaching a condition in the tank when we could expect some purification, as the volume of activated sludge increased, the purification was increasing, and the time required for actual blowing was reduced from days to hours until we got to the period covered by the averages below which show best, worst and average results of twenty-five samples, all of three hours' blowing. This particular table is, perhaps, the most interesting as showing the possibilities of the system, the purification averaging thus:—

	Best result.	Worst result.	Average result.
On albuminoid ammonia	77	78	76
On four hours' oxygen	93	81	9
Of exceptional interest are the figures for dissolved oxygen	0·21	0·59	0·46

showing a clear 75 over the recommendations of the Royal Commission.

To sum up the actions of "activated" sludge from the practical point of view, we have (1) a quick flocculation of colloidal matter, (2) a carbonaceous fermentation which reduces the oxygen-absorbed figure, (3) a breaking up of the albuminoid content, with a quick oxidation of this nitrogenous matter. Dealing with these in the order named we find that a sample of sewage, after blowing for one hour, shows a very distinct change from the crude sewage, and after three hours' blowing and two hours' settling we have had samples that were quite as clear as drinking water, the average daily sample showing, if anything, only the faintest trace of opalescence. Of the reduction of the oxygen-absorbed figure, we have, in many analyses, evidences of very quick change. To quote a few taken haphazard:—

PARTS PER 100,000.

	Crude sewage.	After 1 hr. blowing.	Percentage purification.
Oct. 12th	8·3	1·83	78·0
Oct. 13th	11·0	1·8	85·8
Oct. 16th .	8·7	1·45	83·3

These are generally indicative of what is daily happening after blowing for one hour only.

With regard to the oxidation of the nitrogenous matter, we can regularly find the presence of nitrites in from ten to fifteen minutes after commencing to blow with the activated sludge, and get from ·5 to 1 part per 100,000 of fully oxidised nitrates in one hour, the remaining two hours' blowing giving a total of from 1 to 2 parts of N as nitrates with the free ammonia reduced to anything between ·03 and a complete disappearance.

It may be argued that, with the above percentage purifications, the blowing may be stopped at the end of one or two hours instead of carrying on the oxidation more or less to finality, but the authors of the system find that the sludge loses some of its "activated" quality unless the oxidation of the nitrogen proceeds to practical completion.

On October 18th we commenced with three to four fillings per day, and by October 23rd we had accumulated in our 12,500-gallon tank more than enough sludge in an activated condition for our requirements, and having previously prepared the next section of

* Paper read at a Manchester District Meeting of the Association of Managers of Sewage Disposal Works on November 14th last.

* These designations of best and worst were given after consideration of the complete analytical figures of each sample.

[illegible] syphon, and after blowing three hours is allowed two hours for settlement, when it is run off. Approximately we fill, blow, settle and empty in seven hours, and as the capacity of our experimental tanks is now 34,500, if we allow for 25 per cent of sludge, we treat some 25,000 to 26,000 gallons per filling, or 75,000 in twenty-one hours. At the present time we are preparing a third section of 22,000 gallons for inclusion in the experiment, so that in two or three weeks' time we hope to be treating some 130,000 gallons per day by this new method.

[illegible] in this new method of treatment we are realising in one tank only all the results which have previously been obtained by means of chemical precipitation, sedimentation, or septic action, and final filtration through either continuous or intermittent percolating [illegible] tanks, and this in the short space of seven hours. The possibilities of the system are very great, and among the principal factors in any new scheme of sewage disposal not the least important will be the reduction in area of land required.

In the purification of sewage by this "activated sludge" principle there is an alternative to the fill-and-draw method which has as yet only been tried on a very small scale—*i.e.*, in small wooden tanks. I refer to the continuous-flow system. Our original 12,500-gallon tank is at present undergoing a little change to allow of this experiment, and I hope to have this at work within a day or two; its success or non-success lies in the future.

Another and important phase of the disposal of sewage by this method is the nature and quality of the sludge produced. Analyses show its high value as a fertiliser, its nitrogen content being some three times, and its phosphoric acid content twice, that of ordinary sludge, while the fatty matter, which is more or less condemned as a constituent of manure, is but about half of that in ordinary sewage sludge. We have here reasonable excuse to plead the old [illegible] it, and a manure of such a composition should, on drying, be readily disposed of in the open market at a price which would afford a fair margin of profit over the expense required to bring it into a saleable condition. We are ourselves preparing four small drainage areas on which to dry our excess of activated sludge, and we shall probably have more knowledge of the behaviour of this sludge in manipulating it for disposal, and of its practical use as a manure in a few months' time.

COST.

In this paper you will probably notice that I have said nothing whatever *re* the all-important question of cost. To give the cost in our own case would be a very difficult matter, and calculations to this effect would be subject to so much speculation that I should prefer more experience in the whole matter before committing myself to any definite figures; besides, we are using a plant which was inaugurated for something entirely different, and while it is successful in bringing about certain results, it by no means follows that it is the best that could be devised for the purpose, and, as numerous experiments are at present being made with the object of fixing a minimum amount of air, to give a maximum result, calculations at the present juncture might be very misleading. In our own case we have prosecuted the work with the one object of *proving the principle*, with plant already in existence, with a success which I venture to think cannot well be doubted.

In conclusion, may I suggest to you that in this matter things are at the very beginning, and there is ample room for managers of sewage works, in conjunction with their analytical chemists and civil and mechanical engineers, to prosecute a work which is [illegible] I believe, will be a considerable factor in formulating the sewage [illegible]

I should like to express my thanks to the chairman and members of the River Conservancy Committee of the Salford Corporation for permission to make public these results.

DRAIN OR SEWER?

ANOTHER HIGH COURT JUDGMENT.

Mr. Justice Sargant, in the Chancery Division on Tuesday, delivered his reserved judgment in the [illegible]

His Lordship said the question was whether the plaintiffs were entitled to enforce a charge upon the defendants for a sum expended in remedying defects to a conduit laying under Hessle-road, and that depended upon whether it was or was not a drain maintainable by the Corporation. The road under which the conduit in question ran was a cul-de-sac communicating with the back yards of cottages belonging to the railway company. These cottages were erected about 1861 upon land belonging to the railway company. The corporation had served the defendants with notice to abate a nuisance, and then had done the work themselves. The cost was £139 6s. 6d., which [illegible] £47 12s. 9d., which was the amount spent upon the drains and the road gullies, but had declined to pay £91 13s. 9d., which represented the amount spent upon the 12-in. conduit. They disputed their liability in respect of the road gullies, but, the amount being small, they paid it on condition that such payment was no waiver of their rights in respect of the 12-in. conduit. One of the points to be decided was whether Hessle-road was a public highway, and on this his Lordship said that, although the road had been dedicated to the public as a highway, inasmuch as they were permitted to use it, the soil of the road still remained in the defendant company. With regard to another point raised, he could not think that a single private drain must necessarily be a drain limited to the draining of houses or tenements, and became a public sewer immediately it drained land. It seemed to him that where a drain pipe was used exclusively for the drainage of certain private houses, and the public had no right of access to it, it remained a private drain, although surface water from a road might be drained into it. A public sewer meant a sewer that served the public generally. Whatever rights of way the public had acquired over this road, the ownership of the surface was left in the railway company, and the corporation had acquired no rights to break it up in order to get at this conduit. The railway company were left in exclusive possession of this 12-in. pipe, and the result was that the corporation were entitled to recover the amount of money they had expended upon it. He would accordingly make an order establishing their charge, and would give them the costs of the action.

Mr. Lawrence, K.C., for the plaintiffs, said a declaration would be sufficient.

His Lordship made a declaration accordingly, with liberty to apply if necessary.

Sewage Disposal at Crewe.—The new scheme of sewage disposal at Crewe, which has cost £50,000, has just been completed.

Northampton Fire Brigade.—The Northampton Fire Brigade has had a motor fire engine of the Merryweather "Hatfield" type in use for upwards of four years. During this period the machine, which is petrol driven, has done excellent work, and proved its superiority over the horse-draught fire engine. The motor was originally fitted with a pair of light telescopic ladders extending to 32 ft., but in order to increase the machine's sphere of usefulness, these ladders have been replaced by a new fire escape of the latest and most up-to-date design, capable of reaching a total height of 60 ft. when fully extended. This escape, which is of the type known as the "sliding carriage" design, has been supplied by the builders of the motor, and the makers have carried out the necessary alterations to the fire engine and fitted substantial supports to accommodate the new escape, and at the same time permit of its being quickly detached when required for use.

The Provision of a Municipal Water Service.*

By LEWIS MITCHELL, M.Inst.C.E., F.G.S., Waterworks Engineer, Bolton.

[illegible]

Probably at no period have the value and necessity of a pure and [illegible] in this utilitarian age, when it is perceived that this [illegible] be reduced to a numerical value, and proved to be a sound public asset. Almost since the day when "there went up a mist from the earth and watered the whole face of the ground" has this—one of the three essentials of life itself—been an object of paramount importance. In the early morning of the world's history it was recorded by the first water-[illegible] of whom we have any authentic account "that the herdsmen of Gerar strove with the herdsmen of Isaac, the son of Abraham, for the wells in the valley of Gerar and captured them, while Isaac removed from the valley and elsewhere digged a well for which they strove not."

In primitive times springs, brooks and rivers, pools and lakes, yielded the requisite supplies, and the earliest settlements were instinctively made in places where water was readily obtained. As long as human habitations were isolated, or only in very small groups, such a supply of water sufficed to meet all demands, and when, owing to drought or the experience gained by the inevitable pollution of the soil it was expedient to obtain another source, migration was easy, since the population was scanty and the land was free to all comers; but as communities increased there came a time when it was necessary for obvious reasons to construct special works either for getting underground water from a great depth or importing it from a distance.

Not infrequently the sites of towns and villages have been determined as much by the possibility of obtaining a supply of water as by other political factors. For example, the congeries of villages that now form London were at first detached from each other, each being built over a patch of water-bearing gravel, and the filling up of the interstices between them became possible only when some more general supply of water than that from wells in the gravel was provided.

In prehistoric times in Britain the shallow excavations made for pit dwellings and the shafts dug for the purpose of extracting flints from the chalk no doubt proved in places how water could be obtained beneath the surface of the earth, and led to the sinking of wells for supplies of water.

ANCIENT WATERWORKS ENGINEERING.

The construction of works for providing water for domestic supplies and for irrigation purposes dates back in other parts of the world to very early times. Hydraulic engineering is the most ancient, as it is probably the most interesting, branch of civil engineering. The railway engineer and the electrical engineer are, in comparison, but creatures of yesterday. In Persia, Egypt and Babylonia there is evidence that the hydraulic engineer had carried out works of considerable magnitude at least 2,000 B.C. In India efforts were made in very early times to preserve and utilise the rains and rivers, and in Beluchistan the great cyclopean dams of stone known as the Ghorbasta were erected, it is believed, about 1,800 B.C.—*i.e.*, over 3,700 years ago. In Greece, Athens was supplied about 520 B.C. with water conveyed by an aqueduct from an ancient spring called Callirhoe flowing from the base of a broad ridge of rock which crosses the bed of the Ilissus. Coming down to the beginning of the Christian era, we find that Rome had then a supply of water from works the remains of which excite our admiration. From the foundation of Rome in 754 B.C. to 313 B.C.—*i.e.*, for 441 years—the citizens were content with using water drawn from the Tiber or from wells or springs; but in that year the Appian water was brought into the city by the Censor Appius Claudius Crassus, who also had charge of the construction of the Appian Way. By the middle of the first century no fewer than nine aqueducts of various dimensions (the largest, Marcia, being 8 ft. 2½ in. by 5 ft. 7 in. wide, and several of them over 40 miles in length) were in use for conveying water from springs and from the river Anio, rising in the Apennines, to the Eternal City set upon seven hills. The cost of one of those aqueducts (Marcia) was, according to Fenestella, 180,000,000 "sestertii," or over £1,600,000. On the assumption that all the nine aqueducts were in use simultaneously, the quantity they could carry would be 70,000,000 gallons daily; but we know from Frontinus (who was the waterworks engineer of Rome in those days), and also from Pliny, that the nine aqueducts were seldom all in working order, two or three generally being out of use for repair. Making allowance for such, however, and for loss en route by unauthorised tappings of the conduits, and surreptitious abstractions which were winked at, and also for leakages, probably 45,000,000 gallons were daily delivered into the city, giving, approximately, 45 gallons per head per day to the inhabitants. This may not seem a very large quantity having regard to the great volume undoubtedly used for baths and fountains, but, on the other hand, we must remember that for purely domestic purposes the greater part of the people used only such water as was carried to their homes in jars upon the heads of slaves and other women, and that many local sources were also available.

FIRST ENGLISH SUPPLIES.

The Romans, not only in their own country, but in the countries they conquered, carried out works the magnificence of which testifies to this day to their skill as engineers. But after the fall of the Roman Empire the construction of waterworks on an extensive scale fell into abeyance. In Britain during the Middle Ages the cities and towns obtained their supplies from public wells, and in some cases water from such wells and springs was distributed by buckets or from casks mounted on wheels. The city of London was first supplied from springs at Tyburn in 1236, wooden pipes then adopted for distribution being used until as late as 1820. Tiverton had a town supply as early as 1240, Northampton in 1150, Bath in 1300, and Plymouth about 1500. But organised waterworks for the provision of supplies of water to towns and cities were not, generally speaking, established until the beginning of last century.

In those earlier days of waterworks a great deal was done by the enterprise of private companies, which provided water for hundreds of towns in this country where there were not in existence public bodies able or willing to perform the duty. Concessions were granted by Parliament to such projectors, who in many cases had no tangible reward, or had to wait a long time before any dividends were realised. In the majority of instances, however, the companies were not actuated by philanthropic motives, but sought a profitable investment for their capital, and under those conditions the supply of water to a town became a trading enterprise, and led to competition that sometimes produced disastrous results. The rates and charges for the commodity supplied were usually fixed by the special Acts of Parliament incorporating the companies, but the limits placed were so high that they were seldom reached. In the earlier Acts there were no restrictions as to the amount of dividend to be paid to the shareholders, nor any provisions to enable consumers to demand a supply. The only protection the public had was their power to set up a rival establishment; and this alternative presented so many difficulties and involved so much expense in doubtful Parliamentary contests that it was rarely tried. In the few cases where competition did take place the result was at first fierce rivalry, a double expenditure of capital, two or three sets of pipes in one street, two sets of canvassers touting for customers, two sets of officers and workmen, staffs of plumbers to transfer customers from one set of pipes to another, involving breaking up of streets; then when the rival companies had by their competition brought themselves to the brink of ruin they saw the folly of their ways, and agreed either to amalgamate or confine their operations to separate districts, so that in the end the public were worse off and were burdened with heavier charges than before the competition began.

As early as 1819 a Committee of the House of Commons came to the conclusion that the principle

* Lecture delivered recently at Bolton.

[illegible] was not applicable to water companies. [illegible] not until 1847 when the first [illegible] Act relating to water supply was passed, the [illegible] the protection of the public [illegible] Act of the time.

AGENCY OF LOCAL AUTHORITY.

[illegible] that a matter of [illegible] to the prosecution of [illegible] be left in private hands, but should be [illegible] the responsible authority of a town or district. Local authorities are [illegible] than companies in connection with the laying up of streets, for paving, the collection of rates, the enforcement of regulations, in [illegible] and in being able to borrow money at low rates of interest. In some respects no doubt a company possesses advantages over an elective [illegible] in continuity of purpose and action, in conducting negotiations, in personal supervision, [illegible] from influences [illegible] and political [illegible] and deterrents the conduct of public men. Notwithstanding all this, the balance of advantages is decidedly in favour of waterworks being in the hands of local administrative [illegible] responsible to and representative of the consumers, whose business should be to see, not that a maximum dividend is obtained, but that there [illegible] at stake as to the purity of the water and its sufficiency for all the domestic and trade requirements of the poorer as well as the wealthier classes, and for all public and [illegible] with whom in this connection the paramount question should not be "how cheaply can a supply of water be provided," but "what is the [illegible] supply that can be obtained at a reasonable and practicable price?"

Practically all the leading municipalities have recognised this as an important public duty, and have secured control of the water undertakings by buying out the companies by which they were established. To-day the value of water undertakings in this country alone which are controlled municipally [illegible] than £200,000,000. Companies first, then corporations, have in the face of opposition often bristling with real and assumed difficulties, constructed and are now constructing works for the provision of water supplies which in point of magnitude, utility and boldness of conception have never been equalled. The magnificent waterworks of the cities of ancient Greece and Rome were chiefly used for the supply of public baths, fountains and pools, and in rare instances to the palaces of kings and the mansions of the aristocracy, but the supply now afforded to every house, however large or small, whether owned or occupied by patrician or plebeian, and on under constant pressure, always available for purposes of necessity, comfort, or convenience, was unknown and undreamt of by the philosophers of ancient Greece or the mighty Emperors of Rome.

QUANTITY OF WATER.

The first consideration in connection with the provision of a water supply for any city, town or district, and the laying out of the necessary works, is to determine what quantity of water will be required; and in practice it has been found most convenient to speak of it as at the rate of a certain number of gallons per head of the population per day. No exact rule can be laid down as to what quantity of water should be provided per capita, as each town has its own particular rate depending upon a variety of circumstances, such as the trade or manufacturing purposes, the habits of the people, and the sanitary conditions. For example, in London, where there is but a comparatively small quantity required for trade purposes, the consumption is 32 gallons per head per day. In Manchester the consumption is 33 gallons, but one-half is used for manufacturing purposes. In Glasgow it is 58 gallons per head per day, but of this 20 gallons are sold for trade purposes, leaving 38 gallons for domestic use. Bradford requires 40 gallons, of which one-half is used for trade; and Bolton uses 24 gallons per head per day, of which two-thirds, or 16 gallons, is for domestic, and one-third, or 8 gallons, for trade purposes. The average for the principal towns in this country is 35 gallons, ranging from 18 for Norwich to 70 for Paisley. In villages and agricultural districts the rate may be taken as from 15 to 18 gallons. In the United States we find New York requires 90 gallons, Boston 60 gallons, and Washington 158 gallons, the average being nearly three times as high as in this country.

It will be readily seen that the necessity for determining with some exactitude the amount to be supplied is of vital importance, for it governs every future detail of the works, size of main pipes, and the capacities of reservoirs, and in arriving at it regard should be had to the fact that, as sanitary principles become better understood, and as the luxury of a good supply becomes increasingly appreciated, the demand will correspondingly become greater. Having ascertained the rate per capita, and the population to be provided for, the quantity of water required to meet all demands is easily arrived at; but in this computation it is imperative to consider also what the rate of increase of the population is likely to be in the future, and make the scheme of works sufficiently comprehensive to meet all possible requirements within a reasonable period. The works of the Corporation of Bolton now supply 7,500,000 gallons—*i.e.*, over 33,000 tons per day. To put it differently, the water required to meet the daily needs of Bolton is equivalent to the area of Victoria-square flooded to a depth of 11 ft.; and if that quantity had to be brought in watercarts each containing 30 cwt., we should have a daily procession of vehicles extending for 70 miles.

QUALITY OF WATER.

The next important inquiry is as to the quality or character of the water required. One characteristic is hardness. The hardness of water is of two kinds—temporary and permanent. Temporary hardness is due to the presence of carbonate of lime or magnesia, which is kept in solution by the adventitious presence of carbonic acid, and may be removed by boiling, and permanent hardness is due to the presence of calcium or magnesium sulphates, chlorides or nitrates, which, owing to their solubility, are most difficult of separation from water. The water supplied to the principal towns in this country varies from 1 deg. to 30 deg., of which these may be cited: Glasgow, 1½ deg.; Manchester, 3 deg.; Liverpool, 4 deg.; Bolton, 5 deg.; Edinburgh, 7 deg.; London, 15 deg. to 20 deg.; and Sunderland 30 deg.

It is essential to determine whether a supply of soft water is imperative for the principal industries of the town. Where trades such as wool-washing, dyeing, bleaching, tanning, calico printing, and the like are extensively conducted a soft water is absolutely necessary. In towns like Bolton, Manchester and Bradford soft water is indispensable. Glasgow, which is proud of its very soft water, effected an annual saving of £40,000 in its bill for soap when Loch Katrine supply was introduced, the reduction in hardness being from 8 deg. to 1½ deg. (Theoretically, the use of water containing 15 deg. of hardness involves a loss of 21½ lb. per 1,000 gallons, which, at 3d. per pound, equals 5s. 4d.) As a rule soft water from moorlands is slightly coloured with peat, which may be greatly reduced by storage and filtration; but not infrequently it possesses the power of actively attacking and dissolving the lead of service pipes and cisterns—*e.g.*, the raw water drawn from the Belmont watersheds is acid, and has a distinct action upon lead, dissolving, on occasions, as much as ½ grain of lead per gallon, and unless its acidity were neutralised, its effect would be very pronounced in causing cases of plumbism. It is singular that the soft peaty waters from the moorlands of Lancashire and Yorkshire in particular are acid (surely this is in contradistinction to the character of the people in the counties of the Red and White Roses!), but the medical officer to the Local Government Board stated, in his report for the year 1890, that "upwards of 600,000 persons in the West Riding of Yorkshire alone appear to be, at one or another time, liable to lead poisoning by the drinking of water supplied to their districts." Bolton, Keighley, Bradford, Sheffield and other towns were then suffering in consequence of portions of their supplies being of an acid nature, and the Local Government Board deputed several of their medical officers to conduct certain chemical and bacteriological studies to determine the conditions under which waters can acquire the power of dissolving lead. The acidity, as those experts found, is not, as some observers think, due to sulphuric acid which is present in the air in immense quantities in districts where certain iron and other ores are smelted, nor to the slow oxidation of iron pyrites in the soil (which, as is well known, forms sulphuric acid when in the presence of oxygen and moisture), but to the presence of certain bacteria in the humic substance of the peat.

(To be continued.)

Law Notes.

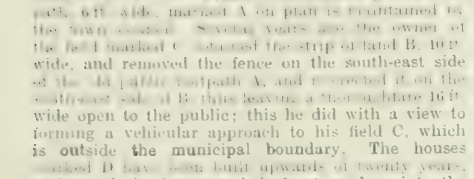
Edited by F. B. JELGNER CONDER, 57 Moorgate Street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, and correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in* BLACK *ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

PRIVATE STREET WORKS—WIDENING OF OLD FOOTPATH.—"J. W. W." writes: The ancient public footpath, 6 ft. wide, marked A on plan is maintained by the town council. Seven years ago the owner of the field marked C purchased the strip of land B, 10 ft. wide, and removed the fence on the south-east side of the old footpath A, and erected it on the south-east side of B, thus leaving a clear space 16 ft. wide open to the public; this he did with a view to forming a vehicular approach to his field C, which is outside the municipal boundary. The houses marked D have been built upwards of twenty years, and are drained across their front gardens into the public sewer in Crown-street. Those marked E were built five years ago and are also drained into the



public sewer at Crown-street, as shown by a thick dotted line on plan; this drain was put down by the then owner of the property marked E, but nothing was done with respect to the construction of the street along the frontage of these houses. Crown-street is an old public highway 30 ft. wide. The Model By-laws are in operation here, under which new streets must be 40 ft. wide, and the Public Health Acts Amendment Act has also been adopted. Will you please inform me if the owners of the property D could be called upon (1) to give up so much land as would be required to make the street 40 ft. wide, (2) or to bear a proportion of the cost of making the roadway from F to G, also if the corporation, as owners of the public footpath A, and the owner of the field C are also liable to any cost in the matter? The owners of the property E would, of course, be responsible for their share according to the frontage owned by them.

The owners of D cannot be called upon to give up any part of their land for the purpose of widening the street, but the corporation could purchase the necessary land under sec. 150 of the Public Health Act, 1875. In proceedings under sec. 150 of that Act these owners would be liable for their proportion of the cost of making up the road from F to C, including the old footpath. The owner of the field C would not be liable, his field not being within the district—see *Hastings Borough Council v. Birkbeck, &c.*, Sessions, 1906, 1 K.B. 521. The owners of property E would be liable according to their frontage. The corporation would not be liable as owners of the footpath, as this now forms part of the road, and under the last clause of sec. 150 the powers are exercisable with respect to the entire road as fully as if the whole of it was not repairable by the inhabitants at large. The foregoing applies to the 16-ft. road as it now exists. If the corporation buy land from the owners of D for widening the road, the added strip will be repairable by the inhabitants at large, and the frontagers cannot be charged with making it up. *Poplar Assessment Committee v. Hall*, 71 J.P., 564.

WATER SUPPLY—COMBINED DRAIN.—"GEORGE" writes: Several houses have been erected on an estate in a rural district, the natural drainage area of which is into an adjoining urban district. The houses are built on freehold sites and each is the property of separate owners. The first house to be erected was nearest the urban boundary, and the owner entered into an agreement with the urban council to drain into their sewer. The owner of the estate then continued the main drain from the end where the first house joined it, along the road in the rural district, to take each of the remaining sites. As each house was built it was drained into this drain or sewer under agreement with the urban council, and has paid a [illegible] each year to the urban council. The various owners of the houses laid, at their own expense, a water pipe for the supply of water to the various houses, and by agreement with the urban council connected with the urban supply at their boundary, and pay a water charge to the urban council each year. Some years afterwards the owner of the estate laid a 3-in. water main in the road past these houses to a house being erected at the end of the estate, towards which the owner of the new house paid a proportion of the costs. This main is also connected with the urban supply. The original water pipe now proves to be insufficient to give a proper supply to some of the houses, and some of the owners wish to connect with the new main laid by the owner of the estate. Before they can do so, however, they are asked to pay a proportion of the cost of the new main, and also the proportion of the cost of the drain which was laid, and into which they have been draining for the past seven years. (1) Can the owner of the estate prevent the various owners connecting to the water main unless each pays his proportion? (2) Is not the main drain a "sewer"? (3) If a sewer, would it not be vested in and repairable by the rural council in whose district it is situated? (4) Can the owner of the estate claim the proportion of the cost of the drain seeing the houses have been draining into it for the past seven years?

(1) Assuming this main to have been laid by the estate owner under secs. 18 & 52 of the Waterworks Clauses Act, 1847, no one else would have a right to connect to it without his consent, and he could make it a condition that they should pay a proportion of the cost. (2) Yes, from the point at which the drain from the second house is connected with it. (3) Yes, unless it falls within either of the exceptions mentioned in sec. 13 of the Public Health Act, 1875. (4) Not if it is a sewer.

RE-NUMBERING STREET.—"W. L. F." writes: Under sec. 64, the Towns Improvement Clauses Act, 1847, my council has directed me to renumber a certain street at the council's expense, i.e., the council providing and fixing the enamel numbers, with the council's workmen, at the expense of the ratepayers. Kindly let me know if the council has the power to do this.

This section provides that the local authority "shall from time to time cause the houses . . . to be marked with numbers as they think fit." And sec. 65 provides that "the occupiers of houses . . . . shall mark their houses with such numbers as the local authority approve of, and shall renew such numbers as often as they become obliterated and defaced." In a note on these sections in "Lumley's Public Health Acts" (8th edition), pp. 1428-9, it is stated that "the numbers must be provided at the expense of the occupiers, and there is no legal authority for charging them to the rates."

COMBINED DRAIN.—"Drains" writes: A owns two houses the drains of which, after being joined by the drain from a house owned by B, are connected to a ditch. The two owners are served by notice from the urban district council to abate a nuisance caused by the sewage flowing from the combined drain or sewer into the ditch. Are the owners or the council responsible? Is the combined drain after the junction of house No. 2 a sewer?

This drain is undoubtedly a "sewer" from the point at which the drain from the second house connects with it. If the Public Health Acts Amendment Act, 1890, is in force in the district, and the drain itself is in an improper condition, the expense of rectifying it can be put upon the owners under sec. 19 of that Act. But if the nuisance arises merely from the discharge of sewage into the ditch (the drain itself being in proper condition), then the council are responsible, whether the Act is in force or not.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

Country Roads Board of Victoria.

FIRST ANNUAL REPORT.

[illegible] the Country Roads Board of Victoria [illegible] has been [illegible] by the Chairman, Mr. W. Hansen, M.P.S. The report, a [illegible] pages, [illegible] not so much with the constructional work carried out since the appointment of the board in March of last year as with the preliminary work connected with the investigation of the highways in those portions of the State that have been visited, the conditions of the roads in the districts, the existing methods of dealing with the roads by the Government and municipalities, and the board's proposals for giving effect to the provisions of the Country Roads Act.

[illegible] evidence that is advanced by the board in proof of the handicaps under which settlers are at present labouring is the statement that, during the inspections which were carried out in one of the ten districts into which the State has been divided for convenience in making investigations, so much interest was taken in the proceedings that men travelled for miles through rain and mud in order to learn whether they could hope for improved road conditions. Some were met congregated in groups on the tracks in the daytime, while others came as deputations at night to urge that something might be done for them. Many of them actually stated that, although they had been in occupation for fifteen and twenty years, they had not yet had a wheeled vehicle on their holdings. Their evidence to the effect that the country in some parts was retrogressing, and that there is less population in these localities than there was fifteen or twenty years ago, was confirmed by the existence of numbers of deserted homes and holdings which had been abandoned for no other reason than the absence [illegible] in.

It is expected that the proposals that have been outlined for making roads through this territory will effectively relieve the settlers in the vicinity of certain roads, but, owing to the broken nature of the country, there are hundreds of settlers whom the main roads as laid out can never serve, while there are many more who will be unable to use them until connections are made with the main roads from the roads or tracks on which their homes are situated. While these connecting roads are less important than those determined upon as main roads, they are nevertheless essential to the settlers, and to the development of the country, and without them the full advantage which should result from the construction of the main roads will not be reaped. The board therefore considers that it is its duty to bring this aspect of the question under the notice of the Government with a view to the consideration of the claim of the settlers so situated.

Apart from the great handicap such roads are to the settler in his struggle to clear his land and earn a living, they are also a serious factor in retarding the growth of country townships. In the older settled parts of the State it is the custom of the farmers, with their families, to visit the townships at regular intervals for the purpose of transacting their business with the local storekeepers. This, in many instances, is the only outing that the farmer's wife and daughters enjoy, and is a welcome relief from the sameness of everyday life on the farm, but even this little relaxation is denied to many of the wives of settlers, owing to the impassable condition of the roads, with the result that the townships do not reap the full benefit of the trade from the surrounding districts.

Speaking generally of the roads throughout the areas of the State already inspected, the board describe their condition as "anything but satisfactory." They add, however, that there are exceptions to this general statement. In a number of the Western District shires the roads are in good condition. There is also a considerable mileage of good trafficable roads in other districts. In these districts materials in the shape of basalt and gravel are easily accessible, and the topography of the country presented few engineering difficulties in the way of road location; but, with these exceptions, there are only isolated examples of roads that may be classed as good. In the Gippsland district few roads are to be met with that may be termed passable roads beyond a radius of 4 or 5 miles from the principal towns on the main lines of railway. Of this district it is said that "road construction has never kept abreast of settlement, and the task has quite outgrown the resources of the shire councils."

The report continues: "In this hilly, timbered region, road building is more than ordinarily a slow and expensive process, and it is evident that without some form of State assistance the municipal councils would be unable, from their own resources, to serve the outlying districts with passable roads for the next twenty years.

"In the older settled districts inspected there has been an unmistakable deterioration in the character of the works executed from the period when the District Roads Boards ceased to have control of the main roads to the present time. This remark applies also to the standard of bridge design, which, under the *régime* of the District Roads Boards, was characterised by an air of permanency.

"There could be no better illustration of the extravagance of a policy of cheap construction than is afforded by a comparison of the older and later methods. Many of the old solidly built roads inspected have stood the traffic of years, and are still in fair condition, while many roads of comparatively recent construction have failed utterly. The reasons for this deterioration in the standard of road construction are lack of funds and the absence of a systematic policy. With each shire council working, however conscientiously, for its own interests, and each councillor in the interests of the ratepayers in his own riding, there can be no systematic system of road construction."

In the desire to make the available funds go as far as possible, the general practice is to vote annually a portion of the municipal funds to the construction of isolated patches of roads in sections seldom exceeding ¼ mile in length distributed throughout the shire's ridings. The board admit that, had these sections been designed permanently to improve the worst portions of the roads with a view to their being linked up in a systematic scheme of construction in the future, the policy would be sound enough, but frequently the work has been done in the cheapest possible manner, and without a complete survey of the whole road to insure that the sections constructed would form suitable links in the completed chain.

GRADIENTS, FOUNDATION AND DRAINAGE.

At its inception the board decided that no expenditure in the way of permanent improvements should be incurred on any road, and particularly on unmetalled roads, until it was ascertained by investigation that the location and grades could not be improved at a reasonable cost. While this has occasioned the employment of considerable time and labour in surveys and investigations, it was strongly felt that it would be a sound policy first to locate and grade roads on the best possible routes—even if their final construction had to be delayed—rather than hasten expenditure on existing roads which would for all time be a freight tax on the community.

In any works of road construction undertaken by the board in conjunction with the municipal councils the standard of construction will be made on as sound lines as possible with the materials available, keeping in mind the nature and volume of traffic that now uses, or is likely to use, the roads. The board, as trustees of the fund placed at its disposal, has on all occasions made it clear that, as far as these funds will admit, the best available materials will be used, in accordance with approved modern practice, in the structure of any roads to be subsidised with the funds at its disposal.

Fortunately, in most districts of the State visited, boggy or waterlogged soils are exceptional, and only in those instances where the conditions are such that ordinary macadam would be insufficient, and where suitable stone and labour is available for hand-pitching, will any special foundation be provided.

In other cases, where the foundation soil is unstable and the traffic considerable, a medium course will be followed, which is a compromise between the systems of Telford and Macadam—viz., the laying of a bottom course of broken stone of 2½-in. to 3½-in. gauge metal

The Surveyor

And Municipal and County Engineer.

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is a local labour course, which, after rolling, will be covered with a coat of wearing coat of 2-in. stone, well rolled and bound with clean binding of gravel, chippings, or coarse sand, the bottom coat being considered as the foundation, and the upper the wearing coat, which may be renewed or thickened and strengthened, should increased traffic require it. It is pointed out that, although this method may not have the stability of a hand-pitched foundation, it is much less costly.

Where the foundation consists of wet clay likely to work upwards and exude through the metal, it is suggested as advisable to spread a layer of gravel, sand or sandy loam, and roll this with a horse roller before laying the bottom course of metal. It is further pointed out that it is imperative that the road, to withstand the weight of traffic without injury, should have a foundation, either natural or artificial, that is thoroughly solid and rigid, otherwise the subsoil will yield beneath surface loads, and the road surface will sink and become permanently deformed, causing hollows or ruts to remain. Other advice given by the board is that, should the road bed be ineffectually drained, it will be still more liable to yield, it being added that on low-lying or flat ground it is usually inadvisable to break into the natural surface any more than is necessary properly to grade the road bed. A common error noticed in road-bed formation, it is also remarked, is the practice of excavating or "boxing out" the metal bed to a uniform depth and cross-section, irrespective of the nature of the subsoil or the natural drainage facilities. To excavate the metal bed on low-lying flat ground, where there is insufficient fall from the bottom of the bed to the water-table, is aptly described as being equivalent to spreading the metal in a drain.

Typical cross-sections of roads for adoption under this and other varying conditions, as well as a longitudinal section, showing method of grading by means of vertical curves, are illustrated in appendices to the report.

CAMBER.

The question of road crowns has been the subject of frequent discussion between shire councillors and the board. While only a small number of shire engineers approved of camber, the report states, the councillors are induced, "against their better judgment, to adopt a barrel-shaped road to meet the popular but erroneous idea that this is necessary for the drainage of a road, forgetting that no degree of convexity will allow of free drainage from the road if the surface is allowed to become worn into holes and ruts." The absence of rolling is quoted as another reason for roads being made with a steeper camber than is desirable. The report also emphasises the fact that, in the case of roads constructed with an excessive convexity, the tyres of vehicles do not bear evenly upon the curved surface; consequently, the whole weight of the wheel load is concentrated on one edge of the tyre, which cuts into the road. In this case any increase in the width of tyres will, it is pointed out, have little effect in the preservation of the road surface.

MATERIALS.

Apparently the effects of modern traffic are just beginning to be felt in Australia, and principally in the large centres of population. In Melbourne the advent of the motor bus has brought the problem home to the metropolitan councils, who are coming to realise the fact—already recognised in older countries—that ordinary weak macadam roads are not suitable for this form of traffic, and where these vehicles are constantly in use in large numbers such roads will soon be broken up.

Considering the immense mileage of roads awaiting construction in the country, the choice of road-making materials, it is realised, must be limited to broken stone or gravel for many years to come, if only for reasons of economy. The rate of increase of motor transport in the future cannot be predicted, as the increasing reliability of these vehicles, together with an improvement of the roads, will tend to encourage their use for transport of produce. The board consider it desirable to anticipate this traffic by making the best possible use of the materials available, and the provision of reasonably sound foundations on the main traffic routes.

There are few localities in the portions of the State already inspected where supplies of stone or gravel cannot be obtained within reasonable distance. In some localities where road works are in progress it has been necessary to transport road metal for long distances by rail, not because there was no stone procurable close at hand, but because no effort has been made to prospect for and develop the stone deposits in the district. In several instances the board's officers have already been successful in finding stone suitable for road purposes, the existence of which was not known locally. In other instances, where suitable stone is known to exist, it has not been availed of owing to the inability of the municipal councils to undertake the capital expenditure of a quarrying and stone-breaking plant. In one instance the board observed that a comparatively inferior class of road metal had been transported by rail for a distance of 73 miles at a freight charge of 3s. per cubic yard, while on the side of the road where this metal was being used there existed an outcrop of a much superior basaltic stone. The reverse was usually found to be the case, and as a rule the road authorities have been tempted to use local material of inferior quality when more suitable and durable materials could have been obtained at a small additional cost.

Owing to the time occupied in its preliminary investigations, and in the pioneering work incidental to the organisation of a new department, the board has not yet been able to enter upon a thorough and systematic investigation as regards road-making materials, other than making observations in a general way of the materials that have been used by the several authorities for the construction of roads.

The Melbourne University authorities are co-operating with the board in the matter of testing materials. They are giving the same terms that they grant to other State engineering departments—namely, that all tests shall be carried out free of charge. The board will thus have the effective use of the testing-plant at the Engineering School, which plant consists of 100,000-lb. testing machine, cement testing plant schlerscope, and they are now constructing an abrasion machine, which will shortly be finished. There is also another testing plant on order, and systematic investigation of road material and its cementitious value, together with asphaltic substances, can be undertaken. It is the board's intention, as soon as practicable, to enter upon this research work. Samples of stone will be obtained from every district throughout the State for the purpose of testing their suitability for road-making purposes, and it is proposed to tabulate the results of these tests so that the different classes of stone obtained from the various districts may be classified in a manner to indicate their suitability for road making under the various traffic conditions.

ROAD-MAKING MACHINERY.

The board comment on the fact that there is so little in the way of efficient road-making appliances owned either by the councils or by private contracting firms. Many of the municipalities, as a matter of

[illegible] have no road-making appliances of any description [illegible] even a horse roller.

WIDTH OF ROADS.

[illegible] consideration of the question of the [illegible] to be constructed under the provisions of the Country Roads Act the board has [illegible] a width of 12 ft. on main roads, or [illegible] be more important roads, and 15 ft. to 16 ft. on the main highways. While a width of 9 ft. to 10 ft. is sufficient for a single-track road, it has been noted that these narrow roads are seldom satisfactory. For the national arterial roads and other main highways which carry considerable traffic, a width of 15 ft. to 16 ft. is considered sufficient for a double-track road—a width which will allow two vehicles to pass one another without their having to leave the metalled portion of the carriageway.

Many of the old roads have been pitched and metalled for a width of 20 ft., and even wider; but it is considered unnecessary to incur the expense of metalling a greater width than 16 ft., excepting where these important highways receive the concentrating traffic at the approaches to large centres of population, where the width may be increased to 18 ft. or, in exceptional cases, to 20 ft.

Where main highways pass through country towns it is proposed to adopt a width of 18 ft., leaving the local authorities to bear the cost of any additional width they may consider necessary for local interests.

ENGINEERING STAFF.

The first engineer to be appointed to the board's staff was Mr. A. E. Callaway, formerly engineer to the shire of Woorayl, an officer with a long and varied experience in road location and construction, particularly in rough forest country. Mr. J. R. Kemp, formerly shire engineer for Karkarooc Shire, was also appointed in November, 1913. These officers have been engaged in the examination of plans and specifications submitted by the shire councils, the investigation of road and bridge proposals, and in the inspection of road works in progress.

In addition to road location, surveys have been undertaken by the board's own staff, where the work was urgent and where it was not possible to obtain the services of the shire engineer, owing to the pressure of other shire work, or in cases where important main roads formed the boundaries of adjoining shires, or passed through a number of shires, and it was desirable to adopt a uniform method of construction and supervision throughout, and in certain instances where the shire councils requested the board to undertake the surveys. This work has occupied a considerable portion of the time and attention of the engineering staff, and necessitates the constant employment of four or five survey parties.

Up to June 30th the total length of road surveys completed by the board's staff was 173 miles.

TRAMWAY BILLS FOR NEXT SESSION.

Among the Parliamentary notices for the proposed construction of new tramways are those of the London County Council to extend their present tramways to new termini within the City of London at Tower-hill in lieu of Aldgate, and Smithfield in lieu of Farringdon-street. Various short extensions in the Hackney district are also proposed. Many of these scheme are revivals of proposals to which Parliamentary sanction has been refused in former Sessions. It is also sought by the council to obtain authority to run coupled and trailer cars on lines north of the Thames, a method of working which already obtains on the southern portion of the system.

Edinburgh Corporation are applying for a Provisional Order for new tramways and a tram road in the Colinton and Corstorphine districts.

Dunfermline Town Council are making application for a Provisional Order authorising the construction of a tramway between Dunfermline and the new Rosyth dockyard; also to link up tramways in the Inverkeithing and Forth Bridge districts with those of West Fife.

Glasgow's Water Scheme.—The Corporation of Glasgow, at a special meeting held on Tuesday, decided to proceed with the river Turk water scheme, the estimated cost of which is £327,000.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Doesn't the interesting account in the last issue of The Surveyor of the small professional fees charged by that great engineer John Smeaton compare favourably with the story of another great engineer of more modern times who, while then charging his clients as many guineas an hour as Smeaton charged per day, seized the occasion, on being honoured by being made a F.R.S., of pointing to these letters at the end of his name when certain clients complained that he proposed to charge them more than formerly, and saying: "Do you know what these letters stand for? 'Fees risen since!'" Is it altogether a matter of surprise that he got the additional fees?

• • • •

Is not Liverpool to be congratulated on always appearing to be a little ahead in improvements? Shall we not watch with considerable interest the result of the proposed lighting of some of the new boulevards with acetylene gas? Was it not Liverpool that some years ago made such extraordinary strides in the science of street lighting, and clearly demonstrated that the use of gas as a street illuminant, if judiciously and scientifically allocated, was capable of producing a better effect than electricity, except under certain unfavourable conditions? And did not these experiments lay the foundation of better lighting in most of our towns and cities?

• • • •

As reinforced-concrete roads seems to be coming to the front, it would be interesting to know what gas and water authorities have to say with regard to them. Will the difficulties of opening trenches in such roads be great as are frequently suggested, and will the stability of the whole road be endangered if a longitudinal trench is cut right through the reinforcement? Will it not be interesting to see what will be the results of this new development in carriageway construction?

• • • •

Is it not interesting to find that Mr. Matthews Jones, the new president of the Institution of Municipal Engineers, in dealing, in his inaugural address to that body, with the subject of paving carriageways in a city like Chester, should speak so favourably of the adoption of granite setts? Is it not rather remarkable that there is evidently a rather strong feeling in favour of this description of pavement now prevalent among many men who have made the study of street pavements a specialité? Has not the introduction of the rubber tyre tended greatly to minimise that bugbear of noise which has hitherto militated so strongly against the larger employment of stone setts as a pavement?

• • • •

Would not the ordinary individual consider that a salary of £120 per annum was not an excessive amount to pay for professional services, especially when one realises that most skilful artisans can command better wages than that? Why is it, therefore, that members of local authorities throughout the country appear to look with horror on the idea that £120 per annum should be the minimum salary to be paid their surveyor? How is such a state of things to be remedied? Does it rest with the Institution of Municipal and County Engineers?

• • • •

What has become of the suggestion to form a "Highways Engineering Association," at which papers dealing with road construction and kindred subjects would be discussed? Has not the war dislocated a large number of proposals and suggestions for engineering progress which will now have to wait indefinitely for better times?

• • • •

Would it not be interesting to learn what has really been the result of the report on intercepting traps on house drains which was made by a committee of the Local Government Board some time ago? Are intercepting traps still being fixed on house drains? And if not, how is the difficulty with regard to the by-laws of the district overcome if intercepting traps are therein specified? Would not some further correspondence on this question be somewhat enlightening at the present time?

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

442. Building Materials. What are encaustic tiles, and how are they made?

443. Vectors. What are vector quantities? Explain how they may be added together graphically.

444. Strength of Shaft. Find the relation between the stress on a twisted shaft and the moment producing it. Find the least diameter of a solid steel shaft to transmit 200 horse-power at 150 revolutions per minute, the stress being limited to 9,000 lb. per square inch.

445. Cement Testing.—Sketch and describe the apparatus necessary for conducting the bushel weight and specific gravity tests for Portland cement.

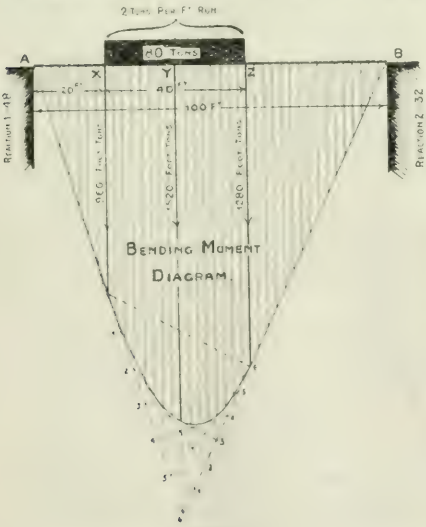
446. Materials.—What is Mexican bitumen? Is it a natural product, like Trinidad lake bitumen, or is it merely a trade term for a by-product of petroleum? If the former, what part of Mexico does it come from? (H. E. W., *Tottenham.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

441. Bending Moment. A beam of 100 ft. span has a load of 2 tons per foot-run uniformly distributed over 40 ft. of its length, commencing at 20 ft. from the left-hand abutment. Draw the bending moment diagram. ("Ajax.")

Before the bending moment diagram can be drawn it is necessary that the bending moment must be calculated in three places—in the centre of the load and at each end. The elevation of the



SCALES.
1 in. = 40 ft.
1 in. = 600 ft.-tons.

beam, with the load in position, should be drawn to scale as shown. The next process is to ascertain the reactions at each abutment, and for this purpose the weight can be considered as being concentrated [illegible] of span. The weight on the distance to the right-hand abutment, [illegible] by the total span will give the reaction at the left-hand end, and [illegible] The reactions are therefore:—

$$\frac{80 \times 60}{100} = 48 \text{ tons weight}, \quad \frac{80 \times 40}{100} = 32 \text{ tons}$$

To calculate the bending moment at any point, multiply either reaction by the distance from the reaction to the point; but if any weights are situated on the distance a deduction must be made equal to the intervening weights multiplied by the distance from their points of application to the point where the bending moment is required to be found. Each calculation can therefore be checked by making calculations about each abutment. The BM at X is therefore about reaction A = 48 × 20 = 960 foot-tons, and about reaction B = 32 × 80 − 80 × 20 = 960 foot-tons.

The BM at Y is also about reaction A = 48 × 40 − (40 × 10) = 1,520 foot-tons, and about reaction B = (32 × 60) − (40 × 10) = 1,520 foot-tons. The remaining calculation for the bending moment at Z is: about reaction A = (48 × 60) − 80 × 20 = 1,280 foot-tons, and about reaction B = 32 × 40 = 1,280 foot-tons.

The three bending moments are set down to scale from the points X, Y and Z, and the diagram constructed as illustrated. The bottom portion of the diagram is a parabola, which is constructed as shown by the dotted lines. The length of a vertical line drawn down from any point of the beam will give the bending moment at that particular point when measured to scale. The weight and thickness of the beam are neglected in calculations of this kind. (P. H., *Middlesbrough.*)

SOME RECENT PUBLICATIONS.*

ENGLISH, FRENCH AND GERMAN VOCABULARY FOR WATER SUPPLY IN THE FIELD. By Philip Parker, ASSOC.M.INST.C.E., 25 Victoria-street, S.W.

This exceedingly useful vocabulary has been prepared by the author for the use of those engaged in supplying water to the British troops in the field. Brevity has, of course, been a primary consideration in making such a compilation, but, although the author modestly acknowledges incompleteness, every appropriate word or phrase which is likely to be required is given in the three languages. Some useful data and memoranda are included as an appendix.

We have received a copy of "Asphalt and its Uses," a book which should prove of considerable interest to architects, engineers and builders. The primary object of the work is to give examples of the various uses of asphalt and the methods rendering damp-proof the many forms of construction in which asphalt is incorporated. The book clearly sets forth the specification applicable to the particular work to be undertaken, with details as to cost. In addition to the twenty examples published, the publication contains sixteen illustrations of buildings in which Messrs. Salter, Edwards & Co., Limited, Hormead Wharf, Hormead-road, W., have carried out the dampproof and asphalt work. Engineers and architects can obtain a copy of the book free on application to the firm mentioned, and will find it an invaluable addition to their libraries.

Royal Institute of British Architects.—The next examination of licentiates desiring to qualify for candidature as Fellows will take place in January next. Applications for admission to the examination must be sent in before the end of December. Full particulars may be obtained on application to the secretary.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

LOCAL GOVERNMENT BOARD INQUIRIES.

[illegible]

INQUIRIES HELD.

Doncaster R.D.C. [illegible] Mr. A. W. [illegible] the supplying [illegible] the gathering of the [illegible] the Wansbeck [illegible] the supply [illegible] the council's reservoir, the agreement being for thirty years, terminable earlier if the council succeeded in [illegible]

Dublin T.C. (November 30th. Mr. P. C. Cowan). —£4,500 for the improvement of the baths and washhouses [illegible] £4,500 had been left by the late Mr. D. T. Mulligan for the purposes of the baths, but as the estate could not be safely realised under present conditions, the corporation had determined to borrow the money.

Leicester T.C. (December 4th. Major C. E. [illegible] explained that the work proposed to be done was a further section of the tributary sewerage scheme in Duke-street, James-street, King-street, Marlborough-street, Marquis-street, Mill-street, part of New-walk, and part of Regent-road. The total length of these sewers was 1,108 yds., and the estimated cost £3,097. There was also storm and trade water drainage in Asylum-street, Deacon-street, and a number of other streets, having a total length of 1,940 yds., and estimated to cost £2,174; in addition there was a storm-water sewer in Woodgate, between Fosse-road and Storey-street, 390 yds. in length, and estimated to cost £1,200, and other sewers of a length of 242 yds. in Leadenhall-street and Spitalhouse-street, costing £448.

Mynyddislwyn (Mon.) U.D.C. (December 4th. Mr. W. M. Cross).—£11,351 for the construction of a [illegible] for the construction of a road from Cwmfelinfach to Pontgam, through Ynysddu and Gelligroes. It is part of a scheme for a main road through the Sirhowy Valley from Cwmfelinfach to Oakdale, joining with the main road through Cross Keys. Portions of the road have already been constructed. The county council will contribute one-fifth of the cost, and the Road Board have promised a grant of £2,000.

Prescot U.D.C. (December 1st. Mr. A. W. Brightmore).—£2,900 for the construction of a new road and bridge between College-road and Warrington-road.—The deputy clerk, Mr. W. A. Cross, explained that the scheme was part of an agreed arrangement with the adjoining authority, the Whiston Rural District Council, in connection with the recent extension of the Prescot urban district. The surveyor, Mr. R. Norris, gave the details of the road construction and the estimated cost. Mr. H. Kempton Dyson, civil engineer, Westminster, the designer of the bridge, which is in reinforced concrete, attended and fully explained the scheme. The inspector afterwards visited the site, and inspected the bridge work now being carried out.—There was no opposition.

South Shields R.D.C. (December 1st. Major C. E. Norton).—£2,720 for the widening and improvement of North-lane-bank, West Boldon, and £5,659 for the construction of a new road from Hubert-street to North Bridge, Boldon Colliery.—The surveyor, Mr. Roland Clarkson, gave the details, and said there would be a 6-ft. asphalt footpath on each side of North-lane-bank. It was explained, with respect to the proposed new road to Boldon Colliery, that this was part of a larger scheme which the council had in view with the object of making a fresh road from one main road to another main road, and thereby [illegible] Boldon Colliery [illegible] access to South Shields.

APPLICATIONS FOR LOANS.

Alnwick U.D.C.—£5,800 for workmen's houses, and £440 for road improvement.

Belfast R.D.C.—£325 for works of sewerage.

Bournemouth T.C.—£2,300 for the purchase of the Pokesdown technical school.

Brixham U.D.C.—£300 for the purchase of land for a hospital.

Carnarvon T.C. £1,240 for a new cemetery.

Cheltenham T.C. £5,500 for paving works.

Chester-le-Street U.D.C.—£8,000 for sewage disposal works.

Colwyn Bay U.D.C.—£28,154 for the purposes of the electricity extensions.

Coventry T.C.—£55,897 for electricity extensions.

Erpingham R.D.C.—£450 for a hospital ward.

Farnham U.D.C. £15,000 for main drainage works.

Fulham B.C. £2,433 for road improvement.

Hanwell U.D.C. £5,000 for the erection of an isolation hospital.

Hendon U.D.C.—£14,222 for works of sewerage.

Oxford T.C.—£30,000 for road works and bridge widening.

Petersfield U.D.C.—£515 for street improvement.

Pontefract T.C.—£21,000 for sewage outfall works.

Ramsgate T.C.—£2,537 for the purchase of property for street improvement.

Salford T.C.—£27,414 for a tuberculosis hospital, and £1,600 for a new reading-room.

Saltburn U.D.C.—£300 for private street works.

South Mimms R.D.C.—£2,750 for the erection of workmen's houses.

Tunbridge Wells T.C. — £500 for sanatorium extension.

Wakefield T.C.—£400 for sewerage works.

Wolstanton U.D.C.—£1,900 for a road improvement.

LOANS SANCTIONED.

Andover T.C. £250 for works of water supply.

Bury T.C.—£1,493 for sewage disposal works.

Deptford B.C.—£9,084 for street improvements.

Eastbourne T.C.—£3,300 (for eighty years) for the purchase of land as a site for working-class dwellings, and £8,095 (for twenty-two years) for sewers and street works in connection with the scheme.

Ennis R.D.C.—£5,000 in respect of the municipal cottages.

Evesham R.D.C.—£2,500 for the Harvington water scheme.

Hemsworth R.D.C.—£2,590 for sewage disposal works.

Horbury U.D.C.—£4,900 for the provision of a public park.

Isle of Wight R.D.C.—£33,000 for a road improvement scheme.

Islington B.C.—£4,975 for electrical plant.

Kidderminster R.D.C.—£1,500 for works of water supply.

Kingstown (Co. Dublin) U.D.C.—£7,900 for the erection of workmen's houses.

Lichfield R.D.C.—£2,124 for works of sewage disposal.

Luton T.C.—£2,100 for the purchase of land for a recreation ground, and £900 for sewerage work.

Southwark B.C.—£2,518 for the provision of a mortuary.

Stoke Newington B.C.—£1,449 for town hall extensions.

Swansea T.C.—£10,000 for water main extension and sewerage.

Torquay T.C.—£15,860 for the electricity undertaking.

Wakefield T.C.—£560 for sewage disposal works.

FORTHCOMING INQUIRIES.

DECEMBER.	£
14.—**Cambridge.** For additions to the Guildhall (Mr. R. H. Bicknell)	6,450
14.—**Hoddesdon.** For cemetery extension (Mr. F. H. Tulloch)	990
15.—**Bridgwater.** For work of sewerage (Mr. W. M. Cross)	1,100
15.—**Cottingham.** For the provision of a sanatorium (Dr. A. S. MacNalty)	5,400
15.—**Hartismere.** For sinking a well (Mr. A. W. Brightmore)	128

		£
15.	**Holmfirth.** For the provision of houses (Mr. W. H. Collier)	3,285
15.-	**Leigh.** For the construction of a bowling green and tennis courts (Mr. W. O. E. Meade-King)	1,200
15.	**Oakham.** For cemetery extension (Mr. R. H. Bicknell)	1,000
16.	**Darlington.** For road construction and the improvement of the cattle market (Major J. Stewart)	1,850
16.—	**Horwich.** For the purchase of a steam roller (Mr. W. O. E. Meade-King) ...	747
16.—	**Lowestoft.** For road construction and piling (Mr. A. W. Brightmore)	1,500
16.	**Reading.** For sewage works extension (Mr. A. G. Drury)	14,500
16.—	**Worcester.** For street improvement (Mr. Edgar Dudley)	3,400
17.	**Brighouse.** For works of sewerage and paving (Major J. Stewart)	2,830
17.—	**Caxton.** For the provision of houses (Mr. H. S. Stewart)	4,700
17.	**Headington.** For works of water supply (Mr. A. G. Drury)	812
17.—	**Manchester.** For private street improvement (Mr. W. O. E. Meade-King) ...	14,110
17.—	**Middlesbrough.** For street improvement (Mr. P. M. Crosthwaite)	4,603
17.	**Weymouth.** For the provision of a sewage screening chamber (Mr. W. M. Cross)	450
18.—	**Farnham.** For the provision of houses (Mr. H. S. Stewart)	450
18.—	**Horbury.** For works of sewerage (Major J. Stewart)	2,027
18.—	**Oswaldtwistle.** For the erection of a boundary fence wall (Mr. W. O. E. Meade-King)	1,074

PRO PATRIA.

[FOURTEENTH LIST.]

We present herewith the fourteenth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Barlow, A., city surveyor of Ripon, has received a commission in the West Riding Division, Royal Engineers.

Beaumont, R. H., surveyor to the Torpoint Urban District Council, has joined the colours.

Cook, Esmond B., pupil of Mr. S. A. Hill-Willis, ASSOC.M.INST.C.E.I., engineer to the Tilbury Urban District Council, 2nd Lieutenant, 7th Battalion, Royal West Kent Regiment.

Harrison, W. N., assistant, borough engineer's department, Keighley, 2nd Lieutenant, 12th Battalion, West Yorkshire Regiment.

Hole, J., surveyor to the Kingsbridge (Devonshire) Urban District Council, has volunteered for active service.

Jones, E. Clement, surveyor and inspector to the Newtown (Montgomeryshire) Urban District Council, London Sanitary Corps.

Leachman, Henry B., chairman, borough engineer's department, Keighley, gunner, No. 3 Battery, Royal Field Artillery.

Luke, Jas. S., surveying assistant, Cornwall county surveyor's department, R. Monmouth Royal Engineers.

Whisstock, Douglas G., surveyor's assistant, Woodbridge Urban District Council, 6th Battalion, Suffolk Regiment (Cyclists).

In connection with the Hemel Hempstead Town Council there have gone to the Front three sons of the mayor (one killed), one son of the ex-mayor, three sons of the late mayor (one killed), three sons of the council's solicitor (two killed), and several members of the staff, one of whom has been severely wounded.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ANNUAL GENERAL MEETING IN LONDON.

[illegible] large attendance of members and others.

ANNUAL REPORT.

The annual report of the association, Mr. J. H. Abbott, ASSOC.M.INST.C.E., recorded with satis- [illegible] ballot in the several districts in accordance with the alteration in the rules passed at the last annual meeting. It was hoped that the various [illegible] thereby be fairly represented, and that the services of the most able members of the association would be secured on the council. The council had decided to [illegible] technical assistance and advice to members. This, it was thought, would be of great assistance, especially in the cases of managers of small works in districts remote from the centres where district meetings took place, and where the managers had few opportunities of attending meetings or coming into contact with other members of the association. The report went on to point out that the financial position of the association remained a strong one, and that the balance- [illegible] showed that the finances [illegible] H. Ball from the post of honorary secretary, the re- [illegible] said it was difficult to express in suitable terms the debt which the association owed to [illegible] work [illegible] done for the members, and, in fact, for sewage works managers generally. It was added that in Mr. James B. Crell, who had come forward to fill the vacancy created, the association were fortunate in having found someone with the ability and energy necessary to carry out the onerous duties of the post, and that the council had every confidence that he would prove as successful as his predecessor. Finally, it was mentioned that the list of members showed that at present only thirty-one out of the fifty-two counties in England and Wales were represented in the association, and that nearly 45 per cent of the members belonged to one of three counties; further, that neither Scotland nor Ireland was represented by a single member. The council proposed to circularise all known managers in the country, and it was hoped that the action would be supported by the efforts of each individual member to enroll as many members as possible.

CONTRIBUTION TO NATIONAL RELIEF FUND.

It was agreed by the meeting that a contribution of £25 should be made to the Prince of Wales' National Relief Fund.

PRESENTATION TO RETIRING HON. SECRETARY.

The chairman said he had next to ask the acceptance by Mr. Ball of an illuminated address placing on record an expression of the members' thanks to the latter for his valuable services as honorary secretary of the association since its formation in 1901, and appreciation of the amiable manner in which those services had always been rendered. The chairman observed that the association had gone on by leaps and bounds. Its success was largely due to the efforts of Mr. Ball, and he was sure that all of them very much regretted that he had been obliged to relinquish the position. Dr. Rideal added that he, personally, owed much to Mr. Ball for the assistance he rendered him during his own year of office.

In acknowledgment Mr. Ball said that, while there was no doubt the duties of the office involved a considerable amount of work, he would be ready to go through it all again if he thought he was to make as many new friends as he had done during the period he had served them as hon. secretary.

The meeting afterwards proceeded to the consideration of a paper by Mr. E. Ardern, M.SC., Manchester, entitled "A Recent Development of the Sewage Problem," which will appear in our next issue.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

[illegible] the more important proposal [illegible] —Dartmouth, Doncaster; refuse disposal—Exeter; [illegible] Glasgow, York; sewerage and sewage disposal—Ellesmere Port, Exeter, Leeds, Pontypridd; [illegible] Eccleshill, Walsall-wood. [illegible] Local Government Board [illegible]

ADMINISTRATION.

Armagh C.C. A resolution has been passed for the [illegible] the taking over the working of the county [illegible] and [illegible] other travelling [illegible]

BUILDINGS.

Burry Port U.D.C. Sanction has been received to a loan for the provision of a public slaughter-house, the purchase of Somerset House, and a scheme of water mains extension.

Colwyn Bay U.D.C.—Contracts have been accepted for new electricity works, estimated to cost £28,000, and a refuse destructor estimated to cost £8,000.

Croydon T.C. In order to find work for the unemployed, it has been agreed to spend £285 upon internal cleaning and painting works at depots, and upon the painting of vans and seats.

Dulverton R.D.C. Somerset County Council have offered to pay three-fourths of the cost of rebuilding Brox Bridge, which connects the Dulverton and South Molton main roads, providing the plans were approved by their surveyor. The rural district council have given instructions for the preparation of estimates.

HOUSING AND TOWN PLANNING.

Clydebank T.C. The master of works has received instructions to prepare a ground plan of the sites on which it is proposed to erect workmen's houses.

Dartmouth T.C.—It has been decided to inform the Local Government Board that the council would consider the advisability of formulating a scheme for the erection of workmen's dwellings at an early date.

Diss U.D.C.—Subject to the sanction of the Local Government Board, it has been resolved to adopt a scheme for the erection of fourteen houses in seven pairs, the pair at each end to have four bedrooms each, and the remainder three bedrooms each.

Doncaster T.C.—An intimation has been received that the Local Government Board have sanctioned the corporation's proposal to erect 102 workmen's houses.

Rotherham R.D.C.—A resolution has been passed authorising a further application to the Local Government Board for authority to prepare a further scheme of housing and town planning in the neighbourhood of Laughton and Brampton.

PARKS AND OPEN SPACES.

Barrow T.C. The offer has been accepted of Messrs. Vickers, Limited, to hand over to the corporation a portion of Vickerstown Park, about 8 acres in extent, the conditions being that the corporation maintain [illegible] a public park and pleasure ground, and that they contribute £1,000 for Vickerstown street making.

Sheffield T.C.—The General Purposes and Parks Committee recommend the council to lay out an eighteen-hole golf course at Tinsley Park Wood at an estimated cost of £5,000.

REFUSE COLLECTION AND DISPOSAL.

Exeter T.C. It is announced that it is the intention of the council to provide a refuse destructor.

Sidmouth U.D.C.—It has been decided (since the shaft at the gasworks could not be lengthened) to ask the Local Government Board if they would sanction the erection of the destructor works so as to use the existing shaft.

ROADS AND MATERIALS.

Birkenhead T.C.—Paving work to cost £332 has been agreed to.

Bradford T.C.—The Streets Committee recommend the town council to purchase property and land at Thornton-road and Westholme-street for £10,000, in connection with the scheme for widening Thornton road.

Cannock U.D.C. The council have approved an estimate of the surveyor, Mr. R. Blanchard, at £365, for work of tar-spraying on the main roads.

Crewkerne U.D.C.—It has been resolved to carry out paving works at an estimated cost of £702, and to apply to the county council for a grant in aid of the scheme.

Derry No. 2 (Co. Donegal) R.D.C.—The council have agreed to contribute an additional £240 towards the local road improvement scheme upon the intimation having been received that the Road Board would sanction a grant of £2,000.

Dorking U.D.C. The surveyor, Mr. W. A. Clegg, has completed plans for an improvement scheme in South-street.

Edmonton U.D.C.—It is announced that Government and other grants, amounting to £4,891, will be received for the Silver-street widening scheme, and that of the remaining sum chargeable to the council, £5,282, the county council will contribute a moiety.

Ellesmere Port U.D.C.—In respect of the scheme for the new north road, the council have resolved to apply to the Road Board, through the intermediary of the Cheshire County Council, for a grant of £5,000.

Folkestone T.C.—The borough surveyor, Mr. E. A. Nichols, has prepared a scheme for widening part of Canterbury-road, at an estimated cost of £5,000.

Glasgow T.C.—The corporation are supporting the Dumbartonshire County Council in an application to the Road Board for a grant of £250,000 for the construction of an extension of the Great Western road from Anniesland to Duntocher.

Guisborough R.D.C. An estimate of £1,158 has been approved for road construction on the Normanby estate.

Kensington B.C.—The Improvements Committee propose to consult an expert on tree culture with a view to the formulation of some definite scheme of tree planting.

Newcastle-under-Lyme T.C.—It is proposed to purchase property, at a cost of £1,600, for the improvement of High-street.

Penmaenmawr U.D.C.—The surveyor, Mr. R. J. Hughes, has received instructions to take in hand the widening and improvement of the road round the Penmaenmawr Point, known as Pen-y-Clip.

Rotherhithe R.D.C.—The council have asked the county council to apply to the Road Board for a grant in aid of the cost, estimated at £2,450, for making up Muglet-lane, Maltby.

Shoeburyness U.D.C.—Plans are being prepared for making up Church-road.

Sunbury U.D.C.—Kingston-road and Staines-road are to be resurfaced with tarmac at an estimated cost of £2,767, and the Road Board have sanctioned a grant of £922 in aid of the work.

Uckfield U.D.C.—It has been agreed to carry out the Ridgewood Hill Improvement, at an estimated cost of £847, towards which the county council will contribute £212, and the Road Board a further sum in proportion.

Westminster B.C. Repairs are to be carried out in Bessborough-street, at an estimated cost of £150.

Whitehaven R.D.C.—The council have agreed to support the scheme of the county surveyor for the diversion of the main road at Rowrah, and the construction of a new bridge, at an estimated cost of £6,670.

York T.C.—The tender of Mr. J. W. Pearce, Doncaster, at £22,203, has been accepted for the construction of the tramway track to Hull-road. It has also been agreed to extend the present system from Lendal archway to the railway goods depot, and from the Fulford-road into the Ordnance Stores, at the request of the military authorities.

SEWERAGE AND SEWAGE DISPOSAL.

Bispham U.D.C.—The surveyor, Mr. T. Harrop, has received instructions to prepare a scheme in conjunction with the surveyor to the Fylde Rural District Council, Mr. T. H. Maxwell, for a proposed sewer along Blackpool road to Bispham railway station.

Croydon T.C.—In connection with the £60,000 scheme for road renovation and improvement, it has been decided, upon the advice of the borough engineer, Mr. G. F. Carter, to relay short lengths of defective sewers or surface-water drains, and construct additional manholes, at an estimated cost of £950. The work will probably extend over two or three years.

Elland U.D.C.—Plans are being invited for the contemplated improvement at the sewage disposal works.

Exeter T.C.—The borough surveyor, Mr. T. Moulding, has received instructions to prepare a report upon alternative sites for sewage works alternative to the sites already proposed.

Leeds T.C.—The tender of Messrs. Harold Arnold & Son, of Leeds, at £141,998, has been accepted for Contract No. 50 in connection with the scheme at Thorpe Stapleton. The proposed works consist of the construction of screening chambers, screen-house, detritus pits, mixing chambers, sewage tanks, storm-water overflow separators, at the outfall of the high-level intercepting sewer, also 18 acres of percolating filters with silt mains, effluent channels, and the laying and jointing of the cast-iron feed supply pipes.

Northampton T.C.—Schemes of drainage and sewerage, estimated to cost £3,750, are recommended by the Highways Committee.

Nottingham T.C.—The council on Monday last passed the scheme for reconstructing the sewer in part of Sherwood Street, at an estimated cost of £2,000.

Pontefract T.C.—The town council have approved a scheme formulated by the Sanitary Committee for the expansion of the sewage works at the east end of the borough according to plans and estimates prepared by Messrs. Balfour & Sons, of Newcastle-on-Tyne. The estimated cost of the scheme is £21,000, and application is to be made to the Local Government Board for a loan.

Prestatyn U.D.C.—Instructions have been given for the preparation of plans, specifications and estimates for a sewerage scheme.

Stratford-on-Avon R.D.C.—The question is under consideration of providing a sewage disposal scheme for Claverdon, at an estimated cost of £3,043.

Warrington R.D.C.—A sewerage scheme, estimated to cost £346, has been approved.

WATER, GAS, AND ELECTRICITY.

Croydon T.C.—The following tenders have been accepted in connection with a duplicate engine and pumps for the new well at Waddon and the supply of cast iron pipes required to complete the pumping mains for the extension of the Surrey street mains to Russell-hill reservoir and the new mains from Waddon to Russell-hill, viz., duplicate engine and pumps, Messrs. Ashton, Frost & Co., Blackburn, £5,365; of cast-iron pipes, the Holwell Iron Company, £4,968.

Evesham R.D.C.—The council on Monday last decided to obtain tenders for the Harvington water scheme.

Hackney B.C.—Further additions are to be made to the electricity plant, at an estimated cost of £20,000.

Knaresborough U.D.C.—The council on Monday formally confirmed the decision to apply for a Provisional Order for an electric lighting scheme.

Leeds T.C.—A reorganisation scheme for the Meadowlane gasworks has been approved, the cost being estimated at about £160,000.

Oystermouth U.D.C.—A decision has been reached to construct a new service reservoir, to instal an additional engine and pump at the waterworks, and to extend the water main, at an estimated cost of £2,800.

Seaton Delaval U.D.C.—It has been decided to extend the water main in order to supply Stickley, North Moor, and Moor Edge.

Wigton R.D.C.—The surveyor, Mr. T. B. Simmons, has prepared plans, which the council have accepted, of water main extensions, estimated to cost £808.

Wolverhampton T.C.—The town council on Monday resolved to promote a Bill to construct additional waterworks, comprising the Ivetsy pumping station, in the parish of Lapley and Wheaton Aston, in the rural district of Cannock, a service reservoir in the parish of Brewood, in the same district, and aqueducts, mains, pipes and other works, and to extend the limits of the corporation for the supply of water so as to include the parishes of Brewood, Featherstone, Hilton, Lapley and Wheaton Aston, Saredon, Shareshill and Stretton, in the rural district of Cannock, in the county of Stafford, the parishes of Blymhill and Weston-under-Lizard, in the county of Stafford, and the parishes of Boscobel and Tong, in the rural district of Shifnal, in the county of Salop.

MISCELLANEOUS.

Greenwich B.C.—It has been agreed to address a communication to the Home Secretary and the Commissioner of Police in support of a regulation requiring that all motor vehicles licensed by the police shall have a sufficient guard effectively to protect foot-passengers being splashed with mud.

Hampton Wick U.D.C.—The surveyor, Mr. P. Taylor, has been authorised to purchase eighteen shovels and twelve picks, and to lend one dozen of each to the 8th Battalion Middlesex Regiment, who require 50 of each tool for training in certain trenches.

PERSONAL.

Mr. F. A. Barnes, borough surveyor of Truro, has had his salary increased by £25 to £250 a year.

Mr. Edward Glover, late county surveyor of Kildare, has been granted a retiring allowance of £352 a year.

Mr. E. F. Rolfe, of Cheveley, Newmarket, has been appointed clerk of works under the West Suffolk County Council.

Mr. T. B. Simmons, surveyor and inspector to the Wigton Rural District Council, has had his salary increased by £10 a year.

Mr. W. E. Wollam, surveyor and inspector to the East Grinstead Urban District Council, was on Monday last voted an increase of salary of £50 per annum.

Mr. M. Moynihan, of the city engineer's department, Dublin, is recommended by the Committee of Chairmen and Vice-chairmen for appointment to the office of assistant borough surveyor.

Major A. C. H. Kennard, one of the London County Council representatives on the Traffic Board, having offered himself for active service, the council have appointed Mr. William Haydon in his place.

Mr. H. Knight, assistant surveyor to the Brentford Urban District Council, who has been congratulated by that authority upon passing the associated membership examination of the Institution of Civil Engineers, has had his salary increased to £175.

Mr. Edgar F. Willson, Kingsbridge, Devon, who was appointed surveyor for the Eastern district of the Docking Rural District Council, has declined the appointment as he has received promises of better prospects in his present position.

Mr. Owen Geoffrey Stanley, engineer and surveyor to the Windlesham Urban District Council, Surrey, has been successful in passing the associate membership examination of the Institution of Civil Engineers. Mr. Stanley is now serving as lieutenant in the Army Service Corps, having been transferred from the Oxfordshire and Buckinghamshire Light Infantry, to which he was first gazetted.

Sir George Gibb, chairman of the Road Board, has been temporarily appointed an additional civilian member of the Army Council. He will be charged with the supervision of Army contracts. Arrangements are being made for the temporary performance of Sir George Gibb's duties at the Road Board. Sir George is an Aberdeen man, born in 1850. He was general manager of the North-Eastern Railway from 1891 to 1906. He has also acted as chairman of the Metropolitan District Railway Company. He was a member of the Committee on War Office Reorganisation in 1901. A solicitor by profession, he is a LL.B. of London University. In 1904 a knighthood was conferred upon him.

Mr. E. B. Martin, borough engineer and surveyor of Rotherham, has been appointed the new borough

[illegible] and waterworks engineer of Salford, at a [illegible] per year. It was then determined from [illegible] Salford, having particulars after [illegible] under Mr. Martin's [illegible] that the selection was finally made. Mr. Martin served his articles under Mr. E. J. Silcock, borough and waterworks engineer of King's Lynn, where he was largely engaged on port and harbour work, and [illegible] Rotherham in 1907. Previous to that he had had extensive experience of municipal work in the city [illegible] a member of the Institution of Civil Engineers, the Institution of Municipal and County Engineers, and the Institution of Water Engineers.

Mr. A. B. McDonald, city engineer of Glasgow, has [illegible] Mr. McDonald, who will retain his position until May 31st next, will [illegible] per cent of his present salary. His service under the Glasgow Corporation dates back to 1870, his appointment as city engineer being made in 1890. With the late Mr. John Carrick, the former master of works [illegible] the Glasgow city improvement scheme, which involved a total expenditure of about £1,750,000. He was also the engineer of the Glasgow main drainage scheme, the second largest in the world, costing £2,250,000. Mr. McDonald was president of the Scottish branch of the Incorporated Association of Municipal and County Engineers, and after its amalgamation with the [illegible] for some time on the council. He is a member of the Institution of Civil Engineers.

FOR OTHER ADVERTISEMENTS

See End of Paper.

TEMPORARY JUNIOR ENGINEERING AND SURVEYING ASSISTANT required in Borough Surveyor's Office in the North.

Candidates must be neat and expeditious draughtsmen. One who has served articles in Municipal Office preferred. Salary, One Guinea per week.

Applications, stating age, previous experience, accompanied by testimonials, and endorsed "Junior Assistant," to be sent not later than 10 a.m. on the 18th inst., to Box No. 1,494, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, London, E.C. (2,161)

HEAD GARDENER. Applications are invited for the position of Head Gardener to the Eastbourne Corporation.

Commencing Salary £2 2s. per week.

Particulars of duties, &c., to be obtained from the Office of the Borough Engineer, Town Hall, Eastbourne, to whom applications must be sent by Wednesday, the 23rd day of December, 1914. (2,162)

ASSISTANT SURVEYOR wanted with some architectural or engineering experience. £60 to £90, in Northern Burgh. Application, stating age, experience, &c., with copies of three recent testimonials, Box 1,495, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,160)

WILTON RURAL DISTRICT COUNCIL.

STEAM ROLLING.

The above Council invite Tenders for the Steam Rolling of various Roads in their District.

A number of Rollers are required immediately for a long period. Day work.

Particulars from

R. A. SKELTON,
District Surveyor.

Bemerton, Salisbury.
December 9, 1914. (2,164)

WILTON RURAL DISTRICT COUNCIL.

GRANITE.

The above Council invite Tenders for the Supply of a large quantity of 1½-in. and 2½-in. Granite. Immediate delivery of 50 tons daily.

Small sample and prices delivered to Salisbury, Wilton, Wishford and Dinton Stations, to be sent to

R. A. SKELTON,
District Surveyor.

Bemerton, Salisbury.
December 9, 1914. (2,163)

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain.
Take with a gracious frowning as his gift
Everything, anything, or nothing.

MASSINGER. "The Fatal Dowry," Act ii., 2.

DEADWOOD AS A CAUSE OF DRY ROT.

To the Editor of THE SURVEYOR.

SIR,—Every engineer will be interested in the statements made by Mr. E. J. Goodacre at the meeting of the Institution of Municipal and County Engineers at Birmingham the other day.

In the discussion which followed there was considerable interest taken as to the cause of dry rot, and it is not at all surprising to me that this anxiety should pertain in the Midland district, because it is into that district that deadwood is imported.

[illegible] years [illegible] interest the public of this country against the importation of diseased timber, and for six years I have made a hobby of the study of this evil.

When dead timber is used in a building where ventilation is poor it develops fungoid growths which ultimately rot it and transform it into touchwood. The great danger of deadwood lies in the fact that it is exceedingly difficult to detect, so that it is often used by builders in ignorance of its real nature. A builder said to me some time ago that a stack of timber he had just got in was the best he had ever had, because not only was it free from knots, but [illegible] He said [illegible] It was only [illegible] emphatic knowledge of this wood that could convince him that he was using deadwood. Indeed, it is not to be wondered at that many builders are entirely ignorant of this inferior wood. Apart from the question of the reddish hue, there is nothing but the light weight of the wood to distinguish it from good timber.

Deadwood was first exported to England in small quantities in 1885, and ever since has found a rapidly growing market here. No attempt is made to delude buyers. The English importer buys it as Torrak.

The Swedes never use this wood themselves. It is practically unknown in France and Germany.

It cannot even be used for packing-cases for long voyages, because in the close hold of a ship the fungus is spread with startling rapidity.

[illegible] market.

For these reasons I assert and maintain strongly that an Act of Parliament should be passed prohibiting the use of deadwood [illegible]

Yours &c.,

J. H. KING [illegible]

King's Lynn.
December 8, 1914.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 5.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for them are urgently requested to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR.—December 12th.—Aylesbury Rural District Council. £120 per annum.—Mr. F. H. Parrott, clerk.

TEMPORARY ASSISTANT.—December 12th.—Corporation of Bridlington. £2 per week.—Mr. A. E. Matthewman, town clerk.

CLERK OF WORKS.—December 14th.—Holmfirth Urban District Council. £3 per week.—Mr. H. Lomax, clerk, 49 Huddersfield-road, Holmfirth.

ASSISTANT ELECTRICAL ENGINEER.—December 16th.—Fareham Urban District Council. 40s. per week.—Mr. L. Warner, clerk.

TEMPORARY ASSISTANT SURVEYOR.—December 16th.—Abertillery Urban District Council. £2 5s. per week.—Mr. Lionel D. Lewis, engineer and surveyor.

ASSISTANT SANITARY INSPECTOR.—December 17th.—Merton and Morden Urban District Council. £75—£110 per annum.—Mr. C. J. Mountifield, clerk, Council Offices, Merton.

CHIEF ASSISTANT ELECTRICAL ENGINEER.—December 17th.—Corporation of Croydon. £250—£350.—Mr. J. M. Newnham, town clerk, Town Hall.

ROAD FOREMAN.—December 19th.—Rugby Urban District Council. £2 per week.—Mr. A. Morson, clerk.

TEMPORARY ASSISTANT.—December 19th.—Cumberland County Council.—£2 per week.—Mr. William [illegible], surveyor, The County Council.

TEMPORARY ENGINEERING ASSISTANT.—December 24th.—Corporation of Mansfield.—£3 per week.—Mr. T. P. Colltrice, borough engineer and surveyor.

BOROUGH SURVEYOR.—December 29th.—Corporation of Sandwich.—£150 a year.—Mr. E. C. Byrne, town clerk.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of competitions. Such advertisements may, in cases of emergency, only be telephoned (City No. 1056) subject to later confirmation by letter.*

DUMFRIES.—December 31st.—Competitive plans for workmen's dwellings, for the Dumfries Corporation.—Town Clerk.

DONCASTER.—January 23rd.—Designs for laying out a site of 20 acres for the erection of 102 workmen's houses, for the corporation.—Mr. R. A. H. Tovey, town clerk.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation.—Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of competitions. Such advertisements may, in cases of emergency, only be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

PONTYPRIDD.—December 14th.—For the erection of a school, for the Education Committee.—Mr. W. E. Lowe, engineer and surveyor.

KIDDERMINSTER.—December 14th.—For the construction of about 3 miles of cast-iron water mains, principally of 4-in. and 3-in. diameter, valves, hydrants, meters, and meter chambers, for the rural district council.—Mr. W. Fiddian, engineer, Stourbridge.

KIDDERMINSTER.—December 14th.—For providing, laying, and jointing 1,587 yds. of 3-in. cast-iron water mains, and other appurtenant works, for the rural district council.—Mr. G. J. Shepherd, engineer, 85 Chester-road, Kidderminster.

LEITH.—December 14th.—For additions to the Academy, for the School Board.—Mr. G. Craig, architect, 85 Duke-street, Leith.

WALTHAMSTOW.—December 14th.—For alterations to a school, for the Education Committee.—Mr. H. Prosser, architect, High-street.

SOUTHAMPTON.—December 14th.—For the erection of a school, for the corporation.—Borough Engineer.

SOUTHEND.—December 14th.—For the erection of an electricity sub-station and incidental works, for the corporation.—Mr. E. J. Elford, Municipal Buildings.

LANCS.—December 15th.—For additions to Peel Hall, near Bolton, and converting the premises into a sanatorium, for the county council.—Mr. Henry Littler, county architect, 16 Ribblesdale-place, Preston.

BIRKENHEAD.—December 15th.—For the erection of a sanatorium, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

NORTHWICH.—December 16th.—For the erection of four bathrooms at a hospital, for the Hospital Committee.—Mr. J. Holland, clerk, Leadmalthy-street, Middlewich.

WILTS.—December 16th.—For the construction of police cottage, wash-houses and sanitary blocks, for the county council.—Mr. J. G. Powell, county surveyor, Trowbridge.

LEEDS.—December 16th.—For the erection of a tramway shed and other buildings, for the corporation.—Mr. A. E. Kirk, architect, 63 Albion-street.

ROCHDALE.—December 17th.—For school extension, for the Education Committee.—Mr. P. W. Hathaway, Town Hall.

NORWICH.—December 17th.—For the erection of houses, for the corporation.—Mr. A. E. Collins, city engineer.

WEST RIDING.—December 18th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

DEVONPORT.—December 18th.—For the erection of a school, for the Education Committee.—Mr. W. H. Crang, 27 Ker-street, Devonport.

BRADFORD-ON-AVON.—December 19th.—For converting certain properties into two houses, for the urban district council.—Mr. R. B. Lees, surveyor.

SPALDING.—December 19th.—For building six cottages, for the rural district council.—Messrs. Davis & Cowley, architects, 6 Double-street, Spalding, or 2 York-row, Wisbech.

HENDON.—December 21st.—For the erection of a rifle range, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

PRESTON.—December 21st.—For the erection of baths and tramway offices and sheds, for the corporation. Borough Surveyor.

SLEAFORD.—December 24th.—For providing and laying about 6 miles of water mains, construction of tower, reservoir, and other works, for the rural district council.—Mr. W. B. Marsden, engineer and surveyor.

WYCOMBE.—December 24th.—For the erection of six houses, for the rural district council.—Mr. A. L. Grant, building surveyor, 15 High-street, High Wycombe.

WEST SUFFOLK.—December 28th.—For the reconstruction of a bridge, for the county council.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

NANTWICH.—December 29th.—For the erection of eight workmen's houses, for the rural district council.—Mr. C. E. Davenport, architect, 152 Hospital-street, Nantwich.

EAST STOW.—December 30th.—For the erection of working-class dwellings, for the rural district council.—Mr. H. E. Wilkes, clerk, Council Offices.

BEBINGTON.—December 30th.—For the erection of a school, for the Sub-committee for Education.—Messrs. E. Kirby & Son, architects, 5 Cook-street, Liverpool.

UPTON-UPON-SEVERN.—December 31st.—For the construction of water supply works, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

SURREY.—December 31st.—For the provision and erection of permanent buildings of light construction for school clinics and tuberculosis dispensaries, for the county council.—The Surveyor, County Education Offices, Penrhyn-road, Kingston-upon-Thames.

BATTERSEA.—January 1st.—For the erection of a dust destructor, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

ALICANTE.—January 5th.—For the construction of the first section of the provisions market, for the municipality.—Commercial Intelligence Department of the Board of Trade, 73 Basinghall-street, London, E.C.

CHEPPING WYCOMBE.—January 5th.—For the construction of a ferro-concrete bridge on the Hennebique system, and laying a short length of sewer and surface-water drain, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

FAVERSHAM.—January 7th.—For laying [illegible] with all necessary [illegible] the rural district council.—Mr. H. Hughes, Hughes [illegible], Victoria-street, Westminster, S.W.

WANDSWORTH.—January 9th.—For [illegible] a public library, for the borough council. Mr. P. [illegible], 21 Bedford Hill, S.W.

[illegible]—January 7th.—For the supply of [illegible] the borough council.—Mr. [illegible] Hughes & Kennedy, Victoria-street, S.W.

[illegible] Co., 65 Cornhill, London, E.C.

[illegible]—For the erection of [illegible] teen cottages, for the rural district council. Mr. C. [illegible], Queen's Bench.

Iron and Steel.

SHEERNESS.—December 14th.—For the provision and erection of steam, exhaust, air, water, and other pipes, together with the necessary valves, and other works, for the urban district council.—Mr. F. W. [illegible], 3 Victoria-street, Westminster, S.W.

MANCHESTER.—December 16th.—For the supply of water-tube boilers and alternators, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Committee, Town Hall.

THAKENHAM.—December 19th.—For the supply of cast-iron spigot and socket pipes for the Storrington water supply, for the rural district council.—Major Tulloch & Haworth, engineers, 28 Victoria-street, Westminster, S.W.

SEVERN.—December 31st.—For providing, laying, and jointing about 4½ miles of cast-iron water mains, with valves, hydrants, air valves, and the construction of engine-house and reservoir, for the rural district council.—Messrs. Willcox & Raikes, Union-chambers, 63 Temple-row, Birmingham.

Roads.

WILTS.—December 14th.—For the supply of road metal for a period of one year, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WILTS.—December 14th.—For steam rolling the London and Bath trunk road, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WILTS.—December 14th.—For the supply of tools for work on 348 miles of main roads, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WILTS.—December 14th.—For spraying with Tarvia on lengths of main roads, for the county council.—Mr. J. George Powell, county surveyor, County Surveyor's Office, Trowbridge.

WARRINGTON.—December 14th.—For the supply of concrete flags, Rawtenstall flags, dressed kerbs, granite setts, and Lithofalt paving blocks, for the corporation.—Borough Surveyor.

REIGATE.—December 14th.—For the supply of [illegible] of granite or [illegible] for the board of guardians.—Mr. Frank C. Morrison, clerk, 46 High-street.

FAVERSHAM.—December 14th.—For the supply of 1,000 tons of granite and granite chippings, for the corporation.—Town Clerk.

BIRMINGHAM.—December 15th.—For the supply of 1,500 tons of coal-gas tar, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

ALDERSHOT.—December 15th.—For the supply of Hungry Hill flints, basalt or limestone, and fifty 40-gallon iron drums or iron barrels suitable for holding tar, for the urban district council.—The Surveyor.

SALFORD.—December 15th.—For paving, flagging, rock asphalt works, and sewering, for the corporation.—Borough Engineer.

BIRMINGHAM.—December 15th.—For the maintenance and repair of asphalt pavements, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

CHERITON.—December 15th.—For making up a road, for the urban district council.—The Surveyor.

SOUTHEND.—December 15th.—For making up certain streets, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

SLIGO.—December 16th.—For the supply of 300 tons of granite road metal, for the corporation.—Mr. J. Shea, town clerk.

BIRKENHEAD.—December 16th.—For making up a street, for the corporation.—Mr. C. Brownsdon, borough engineer and surveyor.

LEEDS.—December 16th.—For the supply of lime-[illegible] for repairing flagging and for macadamizing certain streets, for the corporation. Highways Department, [illegible], Leeds.

TUNBRIDGE WELLS.—December 16th.—For making up certain streets, for the corporation.—Mr. W. H. Maxwell, borough engineer and surveyor.

BERKS.—December 16th.—For the supply of broken road materials, gravel and sand, for the county council.—Mr. J. Fred Hawkins, county surveyor, Shire Hall, Reading.

WEYMOUTH.—December 16th.—For the supply of material for [illegible], for the corporation.—Mr. K. J. S. Harris, borough engineer and surveyor.

CROYDON.—December 17th.—For making up a road, for the rural district council. Mr. R. M. Chart, surveyor.

WALMER.—December 19th.—For the supply of 300 tons of granite road metal [illegible] for the urban district council.—The Surveyor.

HERTS.—December 22nd.—For the supply of broken granite [illegible] and [illegible], for the county council. Mr. J. S. Killick, county surveyor, Hatfield.

WESTBOURNE.—December 24th.—For the supply of granite quartzite, or other stone, for the rural district council.—Mr. H. Norris, surveyor, West Ashling, Chichester.

SOMERSET.—December 31st.—For surface-tarring main roads, for the county council. Mr. Edward Stead, county surveyor, Wells.

DERBYSHIRE.—December 31st.—For the supply of granite, basalt, slag, limestone, tarred macadam, tarred chippings,, and other suitable materials, for the county council.—Mr. J. W. Horton, county surveyor, County Offices, St. Mary's-gate, Derby.

CANNOCK.—January 1st.—For the supply of refined tar prepared in accordance with the specification of the Road Board, for the urban district council.—Mr. R. Blanchard, engineer and surveyor.

BROMLEY (Kent).—January 4th.—For works to be executed in the part widening of Mottingham-lane, for the rural district council.—Mr. R. Craig, highway surveyor, Farnborough, Kent.

HUDDERSFIELD.—January 4th.—For the supply of a motor-driven street sweeping machine, with collecting van attached, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

GLOUCESTERSHIRE.—January 9th.—For the supply of stone for main roads, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

WOODSTOCK.—January 11th.—For the supply of best hand-picked unbroken stone, best broken stone (2-in. gauge), best double-screened nuts, and binding chippings, for the rural district council.—Mr. A. G. Higgs, clerk.

EAST GRINSTEAD.—January 20th.—For the sale of a steam roller, No. 2,711, by Aveling & Porter.—Mr. Charles Turton, surveyor, 6 High-street, East Grinstead.

WILTON.—No date.—For steam rolling, for the rural district council.—Mr. R. A. Skelton, district surveyor, Bemerton, Salisbury.

Sanitary.

ECCLES.—December 14th.—For providing and erecting a sewage recording apparatus, for the corporation.—Borough Surveyor.

WAKEFIELD.—December 15th.—For the construction of a main pipe sewer, for the rural district council.—Mr. F. Massie, engineer, Tetley House, Wakefield.

SOUTH SHIELDS.—December 15th.—For the supply of disinfectants, for the corporation.—Mr. D. Morley Mathieson, medical officer of health.

EPSOM.—December 15th.—For works at the sewage farm, including additions and alterations to destructor buildings, with air-compressing machinery and sewage screening apparatus, refuse destructor, two hydrolytic tanks, alterations to settling tanks, laying mains,

and other works.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

STOCKTON-ON-TEES.—December 15th.—For housing aspects and privies, for the rural district council.—Mr. J. Franklin, inspector, Norton.

RHONDDA.—December 15th.—For the construction of a cast-iron sewer 1 mile in length and the supply of cast-iron pipes and specials, for the urban district council.—Mr. H. Barber, engineer and surveyor, Council Offices, Pentre, Rhondda.

MELTON MOWBRAY.—December 16th. For the construction of an outfall sewer, for the rural district council.—Mr. G. E. Fryer, surveyor.

UXBRIDGE.—December 17th.—For the removal of house refuse, for the rural district council.—Mr. C. Woodbridge, clerk, 38 High-street.

BARNSLEY, December 17th.—For sewering portion of a parish, for the rural district council.—Mr. H. Jackson, 39 Newhall-street, Birmingham.

RAMSBOTTOM.—December 17th.—For the construction of a percolating filter, sludge filters, sludge wells, sludge carriers, effluent carriers, and other appurtenant works, for the urban district council.—Messrs. J. Diggle & Son, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancs.

SPENNYMOOR.—December 18th.—For the supply of disinfectants, for the urbian district council.—Mr. F. Badcock, clerk.

HARROGATE.—December 19th.—For the supply of disinfectants, for the corporation.—Mr. J. Marr, medical officer of health.

MIDDLESBROUGH.—December 21st.—For repairs and other sanitary work, for the corporation.—Mr. S. E. Burgess, borough engineer.

TEDDINGTON.—December 21st.—For the construction of tanks, channels, filters, and other works required in the extension of the sewage works, for the urban district council.—Mr. William Fairley, Parliament Mansions, Westminster, and Mr. Marshall Hainsworth, surveyor, Council Offices.

LOTHINGLAND.—December 23rd.—For the removal of house refuse and nightsoil, for the rural district council.—Mr. W. B. Forward, clerk, 148 London-road N., Lowestoft.

BIRMINGHAM.—December 24th.—For the construction of 1,550 yds. of brick sewer and 2 miles of stoneware pipe sewer, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

HUDDERSFIELD.—December 24th.—For the supply of sludge filter cloth, sulphuric acid, B.O.V., and petroleum benzine, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

HEBDEN BRIDGE.—December 24th.—For extensions to sewage disposal works, for the urban district council.—Messrs. John Newton, Son & Bayley, 19 Cooper-street, Manchester.

GREAT HARWOOD.—January 9th.—For alterations and extensions at sewage disposal works, for the Joint Sewerage Board.—The Engineers, Martholme, Great Harwood, Lancs.

KILKENNY.—January 16th.—For the construction of main drainage, for the corporation.—Mr. J. F. Reade, engineer, 29 Baronstrand-street, Waterford.

DARLASTON.—January 21st.—For the construction of stoneware pipe sewers, manholes, cast-iron pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

Stores.

DURHAM.—December 12th.—For the supply of cast-iron direction posts, for the county council.—County Surveyor, Shire Hall, Durham.

GILLINGHAM.—December 22nd.—For the supply of road materials, Portland cement and lime requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal, coke, bricks, paints, oils, varnish, general stores, ironmongery, and disinfectants, for the corporation.—Mr. J. L. Redfern, borough engineer and surveyor.

Miscellaneous.

EPSOM.—December 21st.—For the supply of a trailer with tipping gear, suitable for a 5-ton steam tractor; also for a tank to put into the wagon, for the rural district council.—Mr. T. E. Ware, surveyor, Epsom.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted

ARMAGH.—For the erection of a dispensary, for the county council.—Messrs. Kaye, Parry & Ross, Dublin, architects:—

J. & R. Thompson, Limited, Belfast	£4,026
W. Beckett & Son, Dublin	4,000
Collen Brothers, Portadown	3,900
P. McAleenan, Castlewellan	3,865
A. Frazer & Co., Dublin	3,850
T. Collen, Tandragee	3,818
H. & J. Martin, Limited, Belfast	3,735
P. McKenna & Sons, Armagh	3,666

BARNET.—For the erection of the proposed municipal offices, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor:

Galbraith Brothers, Limited	£5,200
T. Byford	5,163
H. Peppiatt & Cooper	4,973
J. Mowlem & Co., Limited	4,936
A. Porter, Limited	4,936
Edmonsons, Limited	4,839
J. Thomas	4,687
S. E. Moss	4,670
C. Brightman & Sons, Limited	4,619
A. N. Coles, Limited	4,595
Lawrance & Sons, Limited	4,562
Rowley Brothers	4,559
C. P. Roberts & Co., Limited	4,534
F. & H. F. Higgs	4,533
R. W. Hill	4,512
J. Willmott & Sons	4,490
W. Gibson & Co.	4,498
C. J. Newby & Brothers	4,472
Benfield & Loxley	4,467
Henson & Son	4,448
T. W. Heath & Son	4,444
W. & D. Wilkins	4,440
Prestige & Co.	4,430
Battley, Sons & Holness	4,389
Sabey & Son	4,380
W. F. Blay, Limited	4,350
F. Webster & Son	4,328
Allen Fairhead & Son	4,294
A. E. Symes	4,283
C. Miskin & Sons, Limited	4,224
C. Collings	4,210

BRENTFORD.—For the construction of radiated granite-setts paving and wood paving, for the urban district council.—Mr. J. W. Croxford, surveyor.

G. Wimpey & Co., Hammersmith, W.	£9,199
W. Griffiths & Co., Limited, Bishopsgate	8,629
Durax Dustless Roads, Limited, Westminster, S.W.	8,571
Dick, Kerr & Co., Cannon-street, E.C.	8,331
J. Mowlem & Co., Limited, Westminster, S.W.	8,209
Clements, Knowling & Co., Limited, Brentford *	8,077

CHIPPING NORTON.—For alterations and additions to the sewerage and sewage disposal system of the town.—Messrs. Berrington, Son & Watney, Wolverhampton and Westminster, engineers:

W. Thorpe, Hollywood	£9,899
Tilt Brothers, Bromsgrove	9,843
J. J. Shardlow, Leicester	9,762
A. Hill & Son, Kidderminster	9,470
G. Holloway, Wolverhampton	9,400
Rowell & Sons, Chipping Norton *	9,088

GODSTONE.—For the erection of sewage works manager's cottage, Lingfield, for the rural district council.—Mr. T. C. Barralet, surveyor:

Gorham, Warlingham	£491
— Dives, Lingfield	478
— Everitt, Croydon	458
— Johnson, Croydon	438
Mulmer, East Grinstead	431
Head Brothers, Lingfield	396
Payne, Lingfield	372
— Stanford, Lingfield	369
Cooper, Warlingham	367
Gasson, East Grinstead	367
North Downs Building Company, Woldingham	363
— Honour, Warlingham	353
Sanderson, Bordon, Hants	329

Surveyor's estimate, £343.

GODSTONE.—For the construction of 200 yds. of 9-in. sewer and three manholes at Lingfield, for the rural district council.—Mr. T. C. Barralet, surveyor:

— Everitt, Croydon	£128
Yewen, Croydon	125
— Dives, Lingfield	115
— Honour, Warlingham	115
North Downs Building Company, Woldingham	115
— Gorham, Warlingham	106
— Payne, Lingfield	101
— Stanford, Lingfield	98
Head Brothers, Lingfield	91
May, Mortimer & Co., Catford	91
Cooper, Warlingham	65
— Sanderson, Bordon, Hants	60

Surveyor's estimate, £91.

HARTLEPOOL.—Accepted for the supply of stores for the ensuing year, for the corporation:

Bass Brooms and Ironmongery.—W. Oliver, Hartlepool.
Iron Castings.—J. Meredith, West Hartlepool.
Smiths' Work.—Divided between Messrs. Dalkin, Booth, and Nelson.
Oils and Disinfectants.—Denton Brothers and Oliver.
Portland Cement.—Messrs. Trechmann.
Building Lime.—F. W. Dobson, Darlington.
Stoneware Pipes.—T. H. Bradley, West Hartlepool.
Whinstone.—Messrs. Summerson, Cockfield.
Slag.—W. H. Musgrave, Middlesbrough.

PRESTWICH.—For private street works for the urban district council. Mr. S. B. Morgan, surveyor:—

H. W. Williams, Prestwich, Lancs.

TORQUAY.—For laying 3,700 yds. and 6,150 yds. respectively of iron and tile earthenware pipes, for the corporation. Mr. Sampson, borough engineer:—

Contract No. 1.—J. Duke, Plymouth, £1,117.
Contract No. 2.—Hathway & Brothers, Limited, Exeter, £2,112.

WANSTEAD.—For the erection of a caretaker's cottage and meeting-hall, at an avenue, for the urban district council. Mr. C. H. Lessey, surveyor:—

A. J. Dunn, Walthamstow	£[illegible]
A. J. Coomes, Stratford	190
Coomes Brothers, East Ham	175
Woolstencroft & Co., Limehouse	185
W. S. Sharpin, Bow	182
Coggers Brothers, East Ham	180
G. J. Wills, Buckhurst Hill	178
A. W. Rudge, Wanstead	169
F. S. Russell, Leytonstone	119
F. L. Wimott, Wanstead	127
Rogers & Hogwood, South Woodford	70
T. Osborne & Son, Woodford	[illegible]
J. Jolliffe, Wanstead	186
F. C. Stirk, Wanstead	400

WALLASTON.—For the supply of granite and granite chippings, for the urban district council. Mr. Herbert Walker, surveyor:—

	1 in.	1 in. to 1½ in.	¾ in.
	s. d.	s. d.	s. d.
British Macadams, Limited	14 3	14 3	14 3
Brooks, Limited (Guernsey)	17 6	15 0	14 6
J. Carr & Co.	11 6	9 1	10 6
Charnwood Granite Quarries	11 7	9 6	10 3
Clee Hill Dhu Granite Company, Limited	14 7	14 3	9 3
Cliffe Hill Granite Company, Limited	11 11	9 3	8 11
Croft Granite, &c., Co., Limited	11 9	9 5	9 8
Ellis & Everard	12 4	10 0	10 3
Emmens and Stoney Stanton Granite Company	12 4	11 11	10 2
Field & Mackay, Limited	14 3	14 3	14 3
Green Granite Company	12 10	9 7	9 8
Jess Hartshill Granite Company	12 5	9 11	9 8
Mountsorrel Granite Company, Limited	14 3	12 3	11 0
J. Mowlem & Co., Limited (Guernsey)	16 11	16 11	14 11
Standard Granite Quarries, Ltd.		12 6	
Whitwick Granite Company, Ltd.	12 7	10 2	11 2
C. Wall, Limited	11	9 11	9 8
W. Griffiths & Co., Limited (Guernsey)	16 4	14 6	14 9
W. Griffiths & Co., Limited (Graff)	11 3	10 1	10 9
Midland Quarry Company, Ltd.	11 3	9 8	9 8
Roadstone Supply Company, Ltd.	13 3	13 3	11 6
Rowley Regis Granite Quarries, Limited	12 9	12 6	12 3

WHITLEY AND MONKSEATON.—For the construction of carriageway foundations, for the urban district council. Mr. A. J. Russell, surveyor:—

M. D. Young, Whitley Bay, at schedule prices.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

DECEMBER

11-12.—Institution of Water Engineers. Winter General Meeting in London.

14.—Junior Institution of Engineers. Marquis of Graham delivers his Presidential Address. Institution of Electrical Engineers. 8 p.m.

15.—Institution of Civil Engineers: Discussion of paper: "Concreting in Freezing Weather and the Effect of Frost upon Concrete." 8 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon* ON WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH OF MANSFIELD.
TEMPORARY ENGINEERING ASSISTANT.

Applications are invited for the appointment of a Temporary Assistant in the Borough Surveyor's Office at a salary of £3 per week. Applicants must be good Draughtsmen, accurate Surveyors and Levellers, and have had previous experience in a Borough Surveyor's Office.

Applications, stating age and experience, accompanied by copies of three recent testimonials, and endorsed "Engineering Assistant," to be addressed to the undersigned not later than Thursday, the 24th of December, 1914.

T. P. COLLINGE, ASSOC.M.INST.C.E.
Borough Engineer and Surveyor.

Mansfield.
December 8, 1914. (2,158)

PORT-OF-SPAIN CITY COUNCIL.

The Council invite applications for the combined posts of City Engineer and Engineer of the Port-of-Spain Water and Sewerage Works.

2. The salary attached to the post of City Engineer is £400 a year, and to that of Engineer of Water and Sewerage Works, £550 a year, with travelling allowance at the rate of £70 a year.

3. The intention of the Council being that the two posts of "City Engineer" and "Engineer of Water and Sewerage Works" should be held by the same person, every application must be for the two posts combined.

4. The offices are pensionable under the Port-of-Spain Corporation Ordinance, 1914.

5. The appointment, so far as concerns the post of Engineer of Water and Sewerage Works, is subject to the approval of the Governor.

6. Candidates must be corporate members of the Institution of Civil Engineers of England, and must possess experience in the design, construction, and maintenance of waterworks and sewerage systems.

7. Applications, accompanied by not less than three recent testimonials, and stating age and previous experience, must be supported by satisfactory evidence that the candidates possess the qualifications set forth in the preceding paragraph of this notice, and must be forwarded so as *to reach the undersigned not later than the 31st January, 1915.*

8. Candidates must also forward with their applications a medical certificate of fitness for service in the West Indies.

9. The successful candidate will be required to furnish a bond with an approved surety in the sum of £500 for the due performance of the duties of the above offices. He will be required to devote his whole time to the service of the Corporation, and to reside in the City of Port-of-Spain, or within one mile of the limits thereof; and he must be prepared to enter upon the duties of the appointment within one month from the date of the receipt by him of the official notice of his appointment.

JOSEPH ARNOLD LAMY,
Town Clerk.

Town Hall,
Port-of-Spain,
Trinidad, B.W.I. (2,128)

COUNTY BOROUGH OF STOKE-ON-TRENT.
BOROUGH SURVEYOR'S DEPARTMENT.

The Corporation invite applications for the appointment of a Junior Assistant in the Borough Surveyor's Office, at a salary of £75, rising, in the discretion of the Council, to £95 per annum.

Applicants must be neat and expeditious Draughtsmen, and accurate Surveyors and Levellers.

Preference will be given to candidates who have had experience in a Borough Surveyor's Office.

Applications, stating age and experience, accompanied by not more than three recent testimonials, and endorsed "Junior Assistant," must be sent to me not later than Thursday, 17th of December, 1914.

Canvassing, directly or indirectly, will be a disqualification.

A. BURTON, ASSOC.M.INST.C.E., F.S.I.,
Borough Surveyor.

Town Hall,
Stoke-on-Trent.
November 27, 1914. (2,127)

CUMBERLAND COUNTY COUNCIL.
HIGHWAYS DEPARTMENT.

Applications are invited for the appointment of a Temporary Assistant, for at least three months, in the County Surveyor's Department. Applicants must be good draughtsmen, with a thorough knowledge of Surveying, Levelling, and the general work of a Surveyor's Department. Salary, £2 per week.

Applications, stating age and experience, together with copies of two recent testimonials, and stating the earliest date on which applicant can take up his duties if appointed, to be received not later than Saturday, the 19th of December, 1914.

WILLIAM FINCH,
County Surveyor.

The Courts,
Carlisle.
December 8, 1914. (2,159)

TENDERS WANTED.

TENDERS FOR GOVERNMENT PRINTING.

Tenders are invited [illegible] of about £1,[illegible] in value, for the supply of [illegible] Forms of Tenders and Drawings [illegible] Government Departments. These Contracts are confined to London printers.

Tenders for the Supply of the Contracts are required to be delivered not later than 12 [illegible] Wednesday, the 16th December, 1914.

Forms of Tender and Specimens of [illegible] H.M. Stationery Office, Princes-street, Westminster, S.W. (2,[illegible])

DERBYSHIRE COUNTY COUNCIL.

TENDERS FOR ROAD MATERIALS.

Tenders are invited by the Surveyor [illegible] Stone required for the Maintenance of the Main Roads, [illegible]

Granite,
Basalt,
Slag,
Limestone,
Tarred Macadam,
Tarred Chippings,

or other suitable Materials, delivered at various Railway Stations and Wharves in the County during the year ending 31st March, 1916.

Form of Tender and Conditions of Contract may be obtained [illegible] Office, and will be forwarded [illegible] large foolscap envelope.

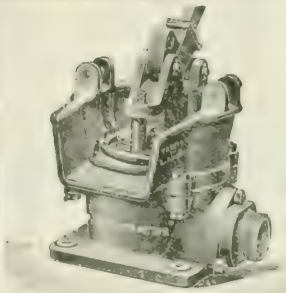
[illegible] Special Form, for which application must be made.

Tenders are to be delivered to me not later than Thursday, December 31st, 1914.

The lowest or any Tender will not necessarily be accepted, and the Committee reserve the right to [illegible] Tender.

J. W. HORTON, [illegible]
County Surveyor.

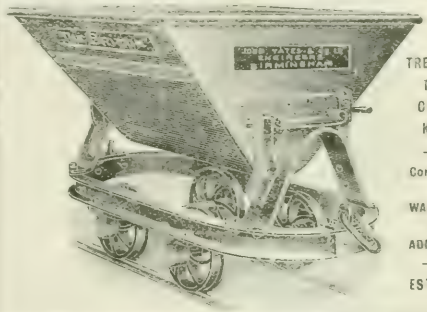
[illegible]
St. Mary's Gate, Derby.
December, 1914. (2,153)



JOHN
YATES
& CO., LTD.,
Aston Manor,
BIRMINGHAM.

[illegible] "YATONIAN."
[illegible]

PUMPS, TIP WAGONS, TRACK, &c.
BRITISH MADE
FROM
BRITISH STEEL



MAKERS OF TRENCHING TOOLS OF ALL KINDS.

Contractors to WAR OFFICE and ADMIRALTY.

ESTD. 1804.

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THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300lb. to the square inch

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

Sanitary.

Over 5,000,000 five million Square Feet in use by H.M. Government.

[illegible]

Address: **Thames Mills, Purfleet, Essex**

[illegible]

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,
[illegible] 36 Hart Street, London, W.C.

VOIDLESS
ASPHALT MACADAM

The Premier Road for Modern Traffic.

Embodies all the essential features of an ideal road.

[illegible]
"Voidless Asphalt Macadam."

HIGHWAYS
CONSTRUCTION, LTD.
FINSBURY COURT,
LONDON, E.C.

MACHINERY AND PLANT

[illegible] Aveling & Porter.

[illegible]

[illegible] with the Surveyor to the Council, Charles Turton, [illegible]

The Council will not necessarily accept any Tender.

Tenders should reach me not later than January 20, 1915, marked "Steam Roller."

FRANCIS S. WHITE,
Clerk to the Council.

[illegible]
East Grinstead. 2,147

TEDDINGTON URBAN DISTRICT COUNCIL.
SEWAGE DISPOSAL WORKS.

The Council are prepared to receive Tenders for the Construction of Tanks, Channels, Filters, and other Works required in the extension of their Sewage Disposal Works, Broom-road, Teddington.

[illegible] at the Office of Mr. William Fairley, Consulting Engineer, Parliament Mansions, Westminster; also at the Office of Mr. Marshall Hainsworth, Surveyor, Public Offices, Teddington.

Copy of the Bill of Quantities may be obtained on deposit of crossed cheque for £5, made payable to the Council, which deposit will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders are to be delivered to the undersigned by noon on the 21st day of December, 1914.

The Council do not bind themselves to accept the lowest or any Tenders.

(By order)
G. H. SALMONS,
Clerk to the Council.

Public Offices, Teddington
November 30, 1914. (2,138)

SURREY COUNTY COUNCIL.
SCHOOL CLINICS AND DISPENSARIES.

The Education and Public Health and Housing Committees of the Surrey County Council invite Tenders for the Provision and Erection of permanent Buildings of Light Construction for School Clinics and Tuberculosis Dispensaries.

Particulars and Specifications may be obtained from, and Plans may be seen at, the Surveyor's Department, County Education Offices, Penrhyn-road, Kingston-upon-Thames, between the hours of 10 a.m. and 4 p.m. on week-days, except Saturdays.

Tenders should be addressed to the Surveyor at the above address, and must be delivered on or before 31st December, 1914.

T. W. WEEDING,
Clerk of the Council.

W. W. FINNY,
Secretary of the
(2,152) Education Committee.

SOMERSET COUNTY COUNCIL.
SURFACE TARRING ON MAIN ROADS.

Tenders are invited for Surface Tarring on Main Roads [illegible] the County during the year 1915.

[illegible] and Urban District Councils, and probably about 160 miles of Roads will be so treated.

Forms of Tender, General Conditions, and Specifications may be obtained from the undersigned, to whom Tenders, endorsed "Surface Tarring," must be delivered not later than Thursday, the 31st December, 1914.

The lowest or any Tender will not necessarily be accepted.

EDWARD STEAD, [illegible]
County Surveyor.

County Surveyor's Office,
Wells.
December 8, 1914. (2,155)

DARLASTON URBAN DISTRICT COUNCIL.

SEWERAGE AND SEWAGE DISPOSAL WORKS.

CONTRACT No. 1.

The Urban District Council of Darlaston are prepared to receive Tenders from Contractors for the construction of Stoneware Pipe Sewers, Manholes, Cast-iron Pipes, Tanks, Filters, together with other works.

Plans and Sections of the proposed Works may be seen, and Specification, Bill of Quantities, Form of Tender and other particulars obtained from the Engineers, on application to Messrs. Dodd & Dodd, MM.INST.C.E., County Chambers, Corporation-street, Birmingham, on and after the 14th day of December, 1914, on payment of a deposit of £5 (note only), which will only be returned on receipt of a *bonâ-fide* Tender and the return of all documents.

Sealed Tenders, endorsed "Tender for Contract No. 1," are to be delivered at my office at Darlaston not later than 12 o'clock noon on the 21st day of January, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
JOSEPH CORBETT,
Clerk.

Town Hall,
Darlaston. (2,157)

FOR those wishing to bring their Appliances and Materials directly to the notice of Municipal Engineers, Contractors and others concerned in Local Government Constructional Work there is no medium so effective as THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER. For advertising rates, &c., apply to Mr. C. S. Mason, Advertising Manager, 24 Bride-lane, Fleet-street, London, E.C.

There is ONE

NONSLIP STONE

and ONE only.

THE HARD YORK NONSLIP STONE CO.,
(BROOKES LTD.,)

LONDON: SAXTON HOUSE, WESTMINSTER, S.W.
HEAD OFFICES: HALIFAX.
MANCHESTER: 8 EXCHANGE STREET.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. DECEMBER 18, 1914. No. 1,196.

Minutes of Proceedings.

Municipal Water Supply.—(2). In our comments last week upon the lecture on "The Provision of a Municipal Water Service," recently delivered by Mr. Lewis Mitchell, M.INST.C.E., the borough waterworks engineer of Bolton, we concluded with a reference to the absence of any liability to provide compensation water in the case of underground supplies. Our readers will probably be aware that the dissatisfaction which exists in regard to the present state of the law on this matter found utterance in 1912 by the introduction into the House of Lords of a Bill bearing the somewhat inappropriate title of the "Water Supplies (Protection)" Bill, the object of which was to impose certain restrictions upon the powers of authorised undertakers, including municipal corporations. One of the provisions of this Bill aimed at rendering water authorities liable to give compensation for injury to private supplies derived from underground water not flowing in any defined channel. The Joint Committee to which the Bill was referred pointed out that this provision would be unequal in its operation, inasmuch as the right of private parties, such as collieries, breweries, railway companies and others to injure private supplies without any liability to make compensation remained untouched. The Bill also raised the larger question of the control of the sources of supply, in regard to which the committee reported in favour of the creation of an organisation empowered to inquire into the whole question of surface and underground water supplies from a comprehensive standpoint, to supervise the allocation of supplies, and to serve as an authoritative adviser to Parliament in the consideration of particular schemes.

Mr. Mitchell deals at some length with the necessary steps, both Parliamentary and engineering, which must be taken to secure a supply from impounding reservoirs. It is here that the greatest engineering knowledge and skill are called into play in the selection of a suitable drainage area, the determination of the available yield, the selection of sites for storage reservoirs, and the design of works. In the selection of the site for a reservoir there are three principal considerations—the elevation, which should be such as to secure a supply by gravitation to every desired point; the configuration of the ground, so that as far as practicable a large basin can be enclosed by embanking across a narrow, impervious defile or gorge; and the foundations. The last point is a very important one, and Mr. Mitchell cites several instances where considerably increased expense was incurred owing to the excavations disclosing a foundation entirely different from that which had been expected. The last part of the lecture deals with the problems of distribution. The legal obligation of a water authority is ordinarily limited to providing a supply for domestic purposes, the charge for which is proportioned to the rateable value of the particular premises. Trade supplies are, however, commonly provided by agreement, a charge being made by measure. In this connection difficult questions have arisen from time to time as to the exact meaning of the expressions "domestic purposes" and "trade purposes." Where, as in the case of a restaurant, the ultimate user of the water is of a domestic character, *i.e.*, for the purposes of consumption or the washing of utensils—although the user takes place in the course of carrying on a trade or business, the charge to be made depends upon the legal status of the supply.

In the most recent case on the subject—*Oddenino v. the Metropolitan Water Board*—it was held that the true test is not the character of the user, but the character of the premises, and that it makes no difference even if the whole of the user is domestic in character, if any part of the premises is used for the purpose of a trade or business. This confusion has led to a suggestion in certain quarters that all water supplies, whether trade or domestic, should be paid for by measure. To this simple solution, however, there are two objections. In the first place it would appear to be contrary to the public interest to adopt any method of payment which would or might tend to undue economy in the use of such a necessity of life and health as water. Then again the capital cost of a meter installation would be prohibitive, apart from the considerable annual charges for inspection, repairs and renewals. On the whole, we think the present arrangement fairly satisfactory, in spite of the fact that from time to time it provides opportunities for the lawyers to exercise their ingenuity.

* * *

Sewage Treatment by Aëration. Although it was so recently as last week that this subject was discussed in these columns in connection with a paper by Mr. W. H. Duckworth, F.C.S., we feel that no apology is needed for reverting to this important development in the art of sewage disposal, which was further dealt with in an interesting paper read by Mr. Edward Ardern, M.SC., last week at the annual general meeting of the Association of Managers of Sewage Disposal Works. In all these recent experiments, the valuable aid of

"activated" sludge in the process of oxidation [illegible] and the necessity for [illegible] sludge with the sewage under treatment is the chief difference between these latest methods of aëration and those earlier experiments, in which [illegible] sludge. In the [illegible] surface contact is retained by the use of slabs of slate placed vertically 1 in. apart in the tank in which the sewage was aërated. This is quite correct, but in the most recently published record of the work done in 1913 by Messrs. H. W. Clark and S. De M. Gage [illegible] that the reduction in nitrogen during the part of August after the gelatinous film had been re-established was *more than* [illegible] *as great* as in July, when the slate surfaces were comparatively clean. The use of the slate slabs thus appeared to play the same *rôle* in the Massachusetts experiments as the mixing of the [illegible] sludge with the sewage in the Manchester experiments. In both cases it is evident that an essential feature of the process is the close contact of the sewage under treatment with the *nidus* of the bacteria: in the one case it is the "activated" sludge, in the other the gelatinous film on the slate slabs. This reminds us of the "absorption" theory of Dr. Dunbar, and we are inclined to agree with Mr. Lowcock's remarks in the course of the discussion upon Mr. Ardern's paper to the effect that "it did not make any difference, as far as principle went, whether they treated the sewage in the presence of what was really activated sludge on the grains of the filter, or blew air through the sewage." As far as we can see, the chief difference is that, while a filter may, and frequently does, become choked, and the amount of air supplied to the sewage is limited to the volume which is drawn into the filter by natural processes, there is nothing to become clogged in an aërating tank, and, further, the amount of air can be increased to any extent, and the maximum quantity that can be efficiently utilised may be supplied to the sewage at all times.

There is another point on which we agree with Mr. Lowcock. "To his mind the whole question was [illegible]. We have said this before on another occasion." In his paper, Mr. Ardern stated that it was [illegible] possible at present to make a definite statement, but in replying to the discussion he said that "in their experiments they had not used more than 15 cub. ft. of free air per square foot of tank area per hour. That was something definite, and would enable them to form some approximate calculation as to the cost." To our mind this is not "something definite," as the area of the tank will depend upon its size, which again will depend upon its depth, and this factor is not given. The Massachusetts investigators, however, do give some definite figures. In their latest publication it is stated that, with a working depth of 5 ft. of sewage, and assuming electric power at 2d. per kilowatt, it would cost about 7s. 8d. to treat 1,000,000 gallons of sewage for five hours with 25,000 cub. ft. of air per hour. This, again, must not be taken as the whole cost of the disposal of the sewage, and the next step should be for some engineers to take a hand in the work. There is no need for any further experiments to demonstrate the principle of the process; what we require is that it should be put into practice on a sufficiently large scale to allow of definite calculations being made as to the cost of operation.

The Subsoil of Highways.

It is, of course, well known that a landowner who lays out a road and dedicates it as a public highway does not thereby part with his property in the soil. On the contrary he is still entitled to make any use of it which is not inconsistent with the public right of passage; he may prevent its being used for any purpose or in any manner not just fixed by the public easement; he can tunnel under it (so long as he does not interfere with the superstructure); he can prevent pipes being laid in it (except under statutory powers), and as a general rule trees and herbage growing on the road belong to him. As regards streets repairable by the inhabitants at large in urban districts, however, these rights are somewhat curtailed, such streets being vested in the urban district council by sec. 149 of the Public Health Act, 1875. We say "curtailed" (not "extinguished") advisedly, because it has been decided that this enactment does not transfer the whole of the subsoil to the council, but only "the surface, and such right below the surface as is essential to the maintenance, occupation and exclusive possession of the street and the making and maintaining it for the use of the public" (*Rolls v. Vestry of St. George the Martyr*, 14 Ch.D., 796).

The consequences of this judicial, though perhaps not very precise, restriction of the meaning of the term "vest" are rather curious. The owner of the subsoil still retains the right of tunnelling, though presumably below the not too definite line at which the urban authority's rights terminate. And while the authority can prevent pipes and wires being laid in the street without their consent, in the event of this being done before they can interfere, the authority cannot compel their removal, though they can forbid the street being opened for their repair. Again, the authority cannot authorise private persons to lay pipes in the street for trade purposes, even though laid no more than 18 in. below the surface in the macadam or made-up ground. This was decided in the case of *The Salt Union, Limited*, v. *Harvey* (61 J.P., 375), which is rather an interesting case and had reference to a street in the borough of Droitwich. The defendants (having first obtained a licence from the Droitwich Corporation) laid pipes in the street (at the specified depth) for carrying brine from their pits to their works. The plaintiffs, who were the owners of the soil of the street (subject to the statutory rights of the corporation), obtained an injunction restraining the defendants from maintaining the pipes in the street, or, in plain English, an order to remove them. Further, except in districts where sec. 47 of the Public Health Acts Amendment Act, 1907, is in force, the urban authority are precluded from constructing lavatories under a street, as was held in the well-known Tunbridge Wells case (*Baird* v. *Tunbridge Wells Corporation*, 1894, 2 Q.B., 867), although the corporation were empowered by a local Act to erect such conveniences "in" any street. Now, however, in districts where the above-mentioned section of the Public Health Acts Amendment Act, 1907, is in force, the local authority are expressly authorised to provide and maintain sanitary conveniences and lavatories in or under any street repairable by the inhabitants at large. But the learned editors of "Lumley's Public Health Acts" point out, in their notes to this section, that it does not vest the subsoil in the authority for the purpose of the provision of such conveniences (as does the Public Health, London, Act, 1891), and that consequently the Tunbridge Wells case seems to show that the authority must, if required, pay for the use of the subsoil. On a future occasion we hope to refer to the question of the relative rights of the

local authority and the landowner in the aerial zone above the highway.

* * *

Institution of Water Engineers.

The nineteenth winter general meeting of the Institution of Water Engineers, which was held at Burlington House last week under the chairmanship of the president, Mr. Thomas Molyneux, was a very successful function. During the business proceedings resolutions were adopted for subscribing from the accumulated fund of the institution a sum of 50 guineas to the Prince of Wales's Fund, and a sum of 20 guineas to the funds of the Red Cross Society—an excellent lead which may well be followed by other professional societies. Afterwards the members settled down to the discussion of a valuable paper entitled "Notes on Scraping a 15 in. Trunk Main at Batley," presented by Mr. J. C. Barrowclough, the waterworks engineer of that town. This work was undertaken owing to a gradual diminution in the discharge of the main from its theoretical capacity of 1,680,000 gallons a day to an actual yield of but 1,092,936 gallons per day in 1911. In the early part of 1912 a trial length of 2,600 yds. was dealt with by means of the "Eric" patent scraper, and the result was so satisfactory that the Water Committee at once gave instructions to proceed with the whole main—some 17 miles in length. So thorough were the preparations for the work, that the whole was accomplished without mishap, with the exception of one or two stoppages due to circumstances which could not have been foreseen. It is interesting to observe that among the miscellaneous matters removed by the scraper were two pick shafts and a crowbar, in addition to about 22 tons of incrustation per mile. The immediate result of the work was to increase the delivery of the main by 434,526 gallons a day. Mr. Barrowclough concluded his paper by stating some general principles gleaned from his experience of the work. First among them was that before work of this kind is commenced the main should be carefully surveyed and all possible information obtained as to the position of any valves or special castings. The importance of this is again emphasised in the author's conclusion that the degree of success attained will materially depend upon the care devoted to the preparations made in advance and a full appreciation of the difficulties likely to be met with. The paper produced a discussion that was at once lengthy, interesting and profitable. As will be seen from our report of the gathering, Mr. F. W. McCullough, the water engineer of Belfast, was elected president of the institution for 1915-16. The summer meeting will accordingly take place in that city, and it is evident from the remarks which Mr. McCullough made in returning thanks for the honour bestowed on him that a cordial welcome will be extended to those who decide to be present on the occasion of his formal installation.

Bognor Council and Insanitary Property.

The Sanitary Committee of Bognor are undoubtedly doing the proper thing in carrying out with vigilance and energy the provisions of the Housing and Town Planning Act. Bognor is a popular seaside resort which, like the majority of old towns of a similar kind, contains certain antiquated and unwholesome specimens of house property, and it is only natural, in the interests alike of the town as well as its inhabitants and visitors, that the urban council should have an eye to the improvement of the local housing conditions. Recently a report was submitted with respect to sixteen dwelling-houses, and it appearing to the Sanitary Committee that these dwellings were in a state so dangerous or injurious to health as to be unfit for human habitation, it was decided to make orders prohibiting the use of the houses until they were rendered habitable. When this decision was announced at the council meeting there was an outburst of what may be termed the customary indignation at the alleged harshness of the manner of enforcing the law. This was duly mingled with expressions of sympathy for the unfortunate tenants who would be disturbed, and an appeal to suspend some of the orders "for a little while." On the question of the suggestion for delay it was pointed out by the clerk that every consideration had been given to the owners of the various properties. Some were given notice as long ago as last February, and none later than March. This, of course, proved the sheer futility of paying any heed to appeals, *ad misericordiam*, on behalf of the owners of slum property, but it also afforded, by way of sidelight, an idea of the plight of the long-suffering tenants. What this is in actuality was elicited by the statement of the chairman of the Sanitary Committee that "some of the houses inspected were like pigsties and hovels, and made the members of the committee who went inside them feel ill." Even this failed to convince the opposition of the necessity for the action it was proposed to take, and in the circumstances it was a satisfaction to feel that the law would take its course, for the clerk pointed out that the Sanitary Committee had executive powers in the matter, and no amendment to the report could be moved until these powers had been revoked.

* * *

The Concrete Institute.

Among the more ordinary problems which confront the structural engineer, few, if any, are of greater importance than those which concern the economical design of beams and girders. The case of members composed of a simple material does not present any very great difficulty, but in the case of a compound material like reinforced concrete new factors are at once introduced. The design in even the simplest cases may be varied to an extraordinary degree either by different modes of arranging the reinforcement or by altering its amount, but in every structure one of the most important considerations is the amount and incidence of the shearing stress which will be set up when it is placed in position. An interesting paper dealing with this aspect of the design of reinforced concrete structures was read at the last meeting of the Concrete Institute by Mr. H. Kempton Dyson, the able secretary of that body. In emphasising the essential differences between the steel or cast-iron girder and the reinforced concrete beam, Mr. Dyson pointed out that the latter is peculiar in that stresses are induced in it in different ways as the quantity or arrangement of the reinforcement is varied. As regards the effect of shear, it was early found in practical work that it was advantageous to reinforce beams against this stress in other ways than by trussing members, and web members were consequently introduced, either alone or in combination with the vertical reinforcements. These web members can in many cases be economically provided by merely turning up the main bars. It must always be remembered that any purely mathematical or theoretical analysis of the stresses in a structure of any kind is largely speculative. In practical work their chief value is to draw the attention of the engineer to the theoretical possibilities of his design. With this knowledge, his experience will enable him to make practical allowances, and in many cases to use simplified calculations which will produce safely approximate results.

The Provision of a Municipal Water Service.*—(2).

By LEWIS MITCHELL, M.INST.C.E., F.G.S., Waterworks Engineer, Bolton

[illegible] hard water is desirable or preferable [illegible] seems to be that, for the general run of people, the matter is relatively unimportant. For example, a [illegible] the evidence submitted to them it was proved that in the British Islands the tallest and most stalwart men were to be found in Cumberland and the Scotch Islands, where the water used is almost invariably very soft. On the other hand, a French Commission appointed to consider the same question reported that the evidence received tended to prove that in hard-water districts the inhabitants had a better physique than those in the soft-water districts, and a Vienna Commission reported in favour of a moderately hard water for a similar reason. By some persons it is considered more palatable, and after they have become accustomed to the use of hard water they would make objection to the introduction of a soft water. Recently Nottingham and Derby, which have been accustomed to water of 10 deg. and 12 deg. of hardness respectively, have strongly resented the supply of comparatively soft water brought from the Derwent Valley, and there is every likelihood that when Birkenhead (which at present gets by pumping from the new red sandstone its water, which is bright and clear, and has a total hardness of 10 deg.) will also object to the soft and brown-tinted water from the river Alwyn, in Mid Wales, whence it will shortly be imported. But, while regard must be had to this quality, it is obviously not always practicable to obtain for a district a supply of soft or hard water according to whichever degree is desired, owing to the cost involved.

Another important consideration in regard to the quality of the water is that it should at its source be free from risk of serious contamination. Absolutely pure water is seldom found in a natural state. In descending as rain from the clouds, it carries down impurities from the air through which it passes. In flowing over or penetrating the surface of the ground it absorbs mineral, vegetable and animal matters. An ideal potable water may be defined as one that is odourless, tasteless, clear, transparent, and free from pathogenic—*i.e.*, disease-producing—organisms. A water which might, however, to the senses of taste, smell and sight, and even from a chemical point of view, be desirable, might, nevertheless, be so grossly polluted with disease-producing germs as to be totally unfit for domestic use. The wholesomeness of water cannot be determined by its appearance; bright, sparkling water may owe its seductive appearance and pleasant taste to sewage contamination, while each drop may contain myriads of fatal organisms. Upwards of 200 varieties of living micro-organisms have been found in water. Many are so minute as to require the highest powers of modern microscopes for their detection; indeed, a cubic centimetre—*i.e.*, a teaspoonful, or seventeen drops—of unfiltered Bolton water contains, on an average, 350 bacteria, and in one sample taken last month the number of organisms found in one cubic centimetre was no fewer than 10,000. Though their identification is often a matter of difficulty, many of them are well-known pathogenic bacteria, including the bacilli of typhoid, cholera, tetanus, anthrax, and of tubercle. Pathogenic bacteria have their origin in the bodies of human beings or animals suffering from disease, and some of them maintain their vitality in water for considerable periods. The germs of enteric fever may come from persons long recovered from the disease, who are technically known as "typhoid carriers"; so that "bacilluria" is a very real danger where water for domestic purposes is drawn from even a sparsely inhabited area. Undoubtedly the pollution which is most dangerous to man is that produced by man himself. The alimentary canal, in health and disease, contains an abundance of the well-known B. coli communis; so that the presence of this bacillus in water (which, unlike typhoid bacillus, is easily determined) is an indication of contamination. In itself it is not considered dangerous, but only as an indication that more virulent species may be present, and it is chosen as a criterion of purity because of the fact that it is always absent in unpolluted water, but present where there is fæcal contamination, and its elimination is regarded as an assurance that all other germs of disease are also absent.

While waters containing impurities both of vegetable and animal origin are constantly being drunk with apparent impunity, yet in almost all cases it is found that sooner or later outbreaks of disease occur, pointing to some specific polluting material having gained access to them.

That serious epidemics have been caused by impure water cannot be doubted, and the instances which can be adduced in proof of this statement are so numerous that it is difficult to make a selection. One has only to mention such instances as the noted outbreak of cholera around Golden-square, Westminster, in 1854, when over 600 deaths occurred in one month, and the cholera epidemic at Hamburg in 1892, when fully 18,000 persons were, within eighty-eight days, attacked with cholera, over 8,000 cases terminating fatally. From July, 1907, to the beginning of 1909 there were upwards of 30,000 cases of cholera in Russia, accounting for 14,000 deaths, from a disease which was proved to have been water-borne. In 1874 there was a serious epidemic of typhoid at Over Darwen, no fewer than 2,035 persons, or one-tenth of the whole population, being attacked within a very short period. In 1882 an outbreak of typhoid occurred at Bangor (North Wales), 540 out of a population of 10,000 being attacked. In 1879 an epidemic occurred at Caterham (Surrey), 179 persons being attacked within a fortnight, and in this case the water was unwittingly polluted by a typhoid carrier. Then there are the well-authenticated instances of typhoid fever epidemics at Beverley (Yorkshire), Sherborne (Dorset), Mountain Ash district (Glamorganshire) with over 500 cases, Terling (Essex), where over one-fourth of the population was attacked within two months; the Maidstone epidemic in 1897; New Herrington (Durham); the Tees Valley in 1890, where there were 1,463 cases; the Lincoln epidemic in 1904, when over 1,000 persons were attacked and 119 deaths ensued in six months; and many others which might be cited; but these typical cases indicate that one of the most fruitful sources of epidemics is the use for dietetic purposes of water obtained from an impure source, or subsequently contaminated before reaching the consumer.

It is therefore most desirable that the water supply should be obtained from an untainted source. There is surely no reason why we should drink water that has been polluted if a supply can be obtained from an unpolluted source.

Having ascertained the quantity of water to be provided, and bearing in mind the great necessity of ensuring its purity, the next matter to be determined is the

SOURCE OF SUPPLY.

Sources of supply may be grouped as follows: (1) Subterranean springs or pervious water-bearing rocks, tapped by wells or boreholes; and (2) lakes or reservoirs which impound the waters of drainage areas.

Frequently the choice is like Hobson's, being chiefly governed by the natural peculiarities of the district and the character of the water desired; sometimes, as in the case of London, it may, solely for financial reasons, be advantageous to take a supply from rivers and from underground sources; or, like Liverpool, to draw it from reservoirs, and also pump it from wells; but generally the relative cost of different projects, gravitation versus pumping, is the determining factor.

All sources of supply are, of course, initially dependent upon the vapours and mists which rise by sun and wind from earth and sea, returning again as the rains of heaven. Notwithstanding the number of meteorological stations and the daily and hourly records made of weather conditions all over the globe, it is only possible to forecast in general terms the weather conditions likely to obtain within the ensuing twenty-four hours, and such terms are usually vaguely ambiguous, while sufficiently comprehensive to cover all eventualities. By continuous and careful observation of the rainfall we are, however, enabled to arrive at certain conclusions as to the available yield

* Lecture delivered recently at Bolton

[illegible] pollution area, and thus to bring [illegible] a source of supply. The [illegible] and by [illegible] observations to [illegible] the loss by evaporation [illegible] and the loss by [illegible] [illegible] all over the British Isles by [illegible] [illegible] over the [illegible] [illegible] the [illegible] of [illegible] [illegible] Dr. [illegible] 20 in. to the eastern counties [illegible] at Cumberland. [illegible] Scotland [illegible] at Southwaite, in Cumberland [illegible] the [illegible] of the British [illegible] reservoirs varies from [illegible] 60 in., while the average for the British Isles is 39½ in. per annum. The highest [illegible] recorded in the year in this country was 257·4 in. at Llyn Lydaw, Snowdon, and the smallest amount was 16·6 in. at Boston, in Lincolnshire. The heaviest recorded rainfall in England and Wales during the 24-hour period, 1909, during three days there were 6 in. at Ramsgate, and 5·27 in. at Eastbourne. Rain at Brighton is taken as 3·60 in. [illegible] in the [illegible] This variation in the rainfall is due to the geographical position with regard to the nature and direction of the prevailing winds; thus the [illegible] on the western coast of England, Scotland and Ireland are [illegible] and precipitate the moisture with which the south-west winds blowing from the Atlantic are laden, which, becoming nearly exhausted before they reach the eastern side of our island, are unable to give the same copious rainfall there.

Next to knowing the rainfall in a district where the supply is to be taken from reservoirs which store the waters flowing off a drainage area, it is important to know how much of this is available the run-off, as it is called, which varies enormously in different regions and at different seasons. A large quantity is absorbed by vegetation and by the ground, or percolates into the rocks and issues at a lower level in springs, or is retained in porous or permeable strata, and some of it is evaporated. For Bolton district the loss by evaporation and absorption has been found by measurement to be 14 in. But in laying out works for appropriating the yield of a watershed an engineer, on the principle that the strength of the chain is that of its weakest link, will be guided by the consideration that the dependable value of a watershed area is its minimum yield, or its capacity to tide over any period of drought, and by the fact that the general mean average rainfall cannot be relied upon, but that, owing to the fluctuations to which it is subject, it is necessary to deduct one-fifth from the mean average to reduce it to the average fall of the three driest consecutive years. In practice it is found that this is the largest amount which can safely be depended upon. Thus, in this district, with an average rainfall of 55 in., the available rainfall or run-off from a watershed over such a period would be only 30 in. per annum. It is, of course, usual, where time will permit, to ascertain by gauging of the streams or rivers the actual yield of the watershed proposed to be tapped, and by a comparison with the rainfall for that period to establish the ratio between those factors.

UNDERGROUND WATER SUPPLIES.

If the geological conditions are favourable to the obtaining of an underground supply—*i.e.*, if close to the district or town to be provided with water there are large tracts of permeable water-bearing strata, such as the new red sandstone or chalk formations—and a sufficient quantity can be pumped from a depth which does not make the cost prohibitive, and a hard water is not considered objectionable, then it is unnecessary for the engineer to trouble about the rainfall and yield of any particular drainage area; all that he is called upon to do is to sink boreholes or wells, and put down an adequate pumping installation for raising the water to service reservoirs large enough to provide against stoppage of the engines. Thus Liverpool gets fully 3,000,000 gallons per day from wells and boreholes sunk in the pebble beds of the new red sandstone formation, and Birkenhead and Wallasey, in Cheshire, pump the bulk of their supplies from the same source, while 20 per cent of the supply to London is obtained from wells sunk into the chalk and the lower greensand, in addition to which it is estimated that not less than 150,000,000 gallons per day are drawn from the London basin by private wells.

The effect of the multiplication of deep wells and the extensive pumping in the London area has been a [illegible] of the place of [illegible] in lowering of the water level, to the extent of 130 ft. in the east end, [illegible] being about 18 in. per annum, and in many parts of Essex wells which were sunk 15 years ago, and then overflowed, have ceased to yield any water. The distance within which a deep well can affect another depends upon many circumstances—such as the continuity of the water-bearing stratum, the porosity of the rocks, and the presence and direction of fissures and faults. Thus the Windsor well, belonging to the Liverpool Corporation, which is 210 ft. deep, is said to have affected the surrounding wells to a distance of 1¾ miles, while certain wells in Essex are found to affect others within a radius of 1¼ miles. Hence the desirability of choosing a site for a well or borehole at a point where the supply is least likely to be influenced by pumping from other wells, more especially since, in such event, there is at present no remedy at law.

The millstone grit formation, which consists of a series of hard and close-grained or pebbly grits, sandstones and shales, yields frequently a good deal of water; in this locality, however, it is more or less concealed by peat on the upland moors, and is covered by glacial drift in the valleys, so that boring operations for underground supplies in this formation are not generally productive of satisfactory results, and as such works are always more or less problematical, reference is sometimes made to a geological expert for guidance, and occasionally the services of a dowser are requisitioned.

DOWSERS.

Here a digression may be made to refer to the powers claimed by the dowser, or water-finder, or, as he is sometimes called, "diviner," who professes to be able to locate underground springs or streams of water. The diviner is, as a rule, far from being pedantic, generally sublimely ignorant of geology, and makes no pretence of scientific knowledge, which he treats with disdain. He claims that, by means of a forked hazel twig carried in the hands, the presence of underground water in motion may be indicated; he is not concerned with the nature of the ground, but is guided solely by the twisting of the forked twig, which he claims to be due to involuntary action on his part. Probably the movement of the rod is the result of an ideo-motor action, so that any idea or suggestion, whether conscious or sub-conscious, that is associated in the dowser's mind with the movement of the twig will cause it to turn apparently spontaneously in his hands. Hence, the divining rod has been used in the search for all sorts of things—from criminals to water. If the dowser is guided entirely by some peculiar sensation he experiences when he lights upon the object of his search, one would have expected to find some blind dowsers, as the blind are peculiarly sensitive in some directions; but from careful investigation I have not been able to discover a single blind dowser in any country of the world during the four centuries the dowsing-rod has been employed.

To imagine that there is any direct connection between underground water and the motion of the rod is shown to be grossly absurd "from the fact that by its aid the dowser of old professed to be able to discover ores of precious metals, buried coins and other treasure, lost boundaries, strayed cattle, and even hiding criminals. Until stopped by the Inquisition in 1701 it had a multitude of uses in the moral world, while nowadays its power is merely utilised in the search for metallic lodes and water." "If one were experimenting with a divining-rod, and found that at a particular spot involuntary muscular movements twisted it, would he not be puzzled to determine whether, in the supposed cavern below him, he might expect to find a running stream or a bolting criminal? Obviously, therefore, the peculiar 'involuntary motion' of the hazel twig and what causes this motion is one thing, and the existence of an alleged water-finding faculty is quite another." (Mansergh.)

The advantages of underground pumped water supplies as compared with impounding schemes are that the initial cost is comparatively small, since it is unnecessary to construct large reservoirs, and very little land is wanted (only sufficient for the pumping plant); treatment of the water is also generally unnecessary, and the liability to pollution is remote if the infiltration of surface water from thickly inhabited districts can be prevented, while no compensation water has to be provided, or water rights acquired from neigh-

neighbouring landowners. Against this must be balanced the cost of repairs and continued annual cost of pumping.

It has been pointed out that, in the case of a well or borehole from which underground water is abstracted by an adjoining or another well or borehole, the owner of the former has no remedy at law against the owner of the latter well, since there are no laws conferring prescriptive rights of property on underground water not flowing in a defined channel. The law with regard to the question of ownership in underground water first became definitely settled by the leading case of *Chasemore* v. *Richards* (1859). The plaintiff in this case was the occupier of an ancient mill on the river Wandle, and for more than sixty years he and the preceding occupiers of the mill had used and enjoyed as of right the flow of the river for the purpose of working their mill. The defendants were the Croydon Local Board of Health, who, for the purpose of supplying the town with water, sank a well to the depth of 74 ft. in their own land at a point about ½ mile distant from the said river, and pumped, abstracted and intercepted underground water that otherwise would have flowed and found its way into the said river, and so to the plaintiff's mill. The quantity so diverted was sufficient to be of sensible value towards the working of the plaintiff's mill. The water so diverted was underground water flowing in no defined channel, but percolating or oozing through the soil more or less according to the quantity of rain that might chance to fall. The House of Lords held that the principles which regulate the rights of owners of land in respect to water flowing in known and defined channels, whether upon or below the surface of the ground, do not apply to underground water which percolates through the strata in no known channels. This decision has been confirmed by subsequent cases, including that of the well-known and oft-quoted action of *Bradford Corporation* v. *Pickles*. In this instance Mr. Pickles, the owner of lands adjacent to those of that corporation, on which were valuable springs of water, sank a shaft on his own property, and drove a tunnel by means of which the waters of the said springs were tapped and conveyed away. The House of Lords (1895) decided that Mr. Pickles was entitled to divert or impound the water percolating beneath the surface of his lands so as to prevent it reaching or assisting to feed the springs belonging to the corporation, thus clenching the common-law doctrine that water percolating underground belongs to the landowner, who can catch it first.

PROTECTION OF UNDERGROUND WATER SUPPLIES.

In 1910 a Bill entitled the "Water Supplies (Protection) Bill" was introduced into the House of Lords by Lord Desborough, by which it was proposed to restrict the powers of authorised undertakers (such as corporations) in the following ways: (1) By preventing the acquisition of fresh underground supplies without specific Parliamentary authority; (2) by rendering water authorities liable to give compensation for injury to private supplies, and (3) where water is taken from one district to supply another, by conferring on the local authorities of the districts from and through which the water is taken the right to demand a supply from the works of the undertakers, terms to be agreed or fixed by the Local Government Board. These proposals were deemed so important that a Joint Committee of both Houses of Parliament was appointed to consider them, and they issued a report upon the matters raised in the Bill, and also with the larger question of the alleged uneconomical use of the water resources of the country. The committee in their report refrained from making any recommendations upon the question of compensation, but rightly pointed out that damage to private property is caused not only by water authorities, who are under statutory obligations, but also by collieries, breweries, railway companies, and others, who also extract water from the subsoil; so that the operations of the Bill would, if passed into law, be unequal. Coming to the larger question, the committee stated that several witnesses had expressed their apprehension that the water supply of the country is not being utilised to the best advantage owing to the want of information on the subject of the general water supply, and the haphazard and arbitrary fashion in which local sources of supply are sometimes wasted, and often appropriated for the benefit of distant places without regard to the needs of the locality from which the water is taken, or of the country as a whole. The committee was struck by the absence of trustworthy information as to the underground water supply available in any particular district, and as to the effect of rainfall on the water levels in various parts of the country. In their opinion a remedy for this state of things is urgently demanded and they thought it may be found by creating an organisation empowered to inquire into the whole question of surface and underground water supplies from a comprehensive standpoint, to supervise the future allocation of supplies, and to serve as an authoritative adviser to Parliament in the consideration of particular schemes. Of course, this idea was not a new one, and various Royal Commissions have made recommendations along the same line, but nothing has yet been done. Only the other day Mr. B. Hall Blyth, president of the Institution of Civil Engineers, in his presidential address stated, in dealing with the question of water supply in Scotland, that, while he admitted that the Local Government Board exercised a zealous control, and took care that adequate supplies of water were provided where they were required, he was satisfied that much money might be saved, and the water supply of the country conserved if a number of places in adjoining districts and counties combined and introduced one large comprehensive supply rather than that each separate place should have an independent supply for itself.

"Take, for instance, my own county of East Lothian," he said. "There every town and village has its own independent supply, with separate reservoirs, separate compensation water, and separate lines of main pipes bringing the water from the hills to the various points of supply." He thought it would have been infinitely better and much more economical if all these places had combined, and had one comprehensive scheme dealing with the whole county.

"Is it," he asked, "too much to hope that, in future—and much remains still to be done—the Legislature will take care that this question of combination is duly considered before any supply for a comparatively restricted district is sanctioned?"

Dealing with the question of the quantity of compensation water that should be given off, the president said it seemed absurd that this should be left to be fought out under every little Bill, and it should be fixed definitely by the Legislature. It often happened that the promoters of a scheme where no landed proprietor had a sufficient interest to oppose it—got off with the provision of far too small an amount of compensation water. This matter was really a national one, and should be settled, not in the interest of any individual proprietor, but of the public at large. When the available sources of supply were yearly becoming more and more scarce it was essential that adequate provision should be made to secure that our rivers and streams had at all times a sufficient supply of water sent down them.

(To be continued.)

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Manchester Engineering and Technological Societies. Acting upon resolutions passed at a conference of representatives of the engineering and technological societies in Manchester, held at the invitation of Sir Thomas Holland on May 1st, a Provisional Organising Committee, then appointed, considered a scheme of co-operation between the societies for the purpose of providing a common meeting-room and reference library, and prepared a circular letter setting out their proposals. Mr. W. P. Anderson, the secretary of the committee in question, now writes that on the outbreak of war he was instructed to withhold this circular, and having since been able to consult Sir Thomas Holland and Dr. Edward Hopkinson (who acted as chairman in the former's absence) he has been requested to say that the latter consider the scheme ought not to be pursued at the present time, when the energies and efforts of so many of those interested are fully absorbed in more urgent work.

THE CHRISTMAS HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in next week's issue of "The Surveyor" must reach us not later than Wednesday morning, December 23rd.

Institution of Water Engineers.

WINTER GENERAL MEETING IN LONDON.

The nineteenth winter general meeting of the Institution of Water Engineers was held on Friday last at Buffalo House, London, under the chairmanship of the president, Mr. T. Melvaine (Stockport). The following members were present: Messrs. Henry C. Adams (London), Arthur Andrew (Oldham), F. J. Bancroft (New Barnet), J. C. Barrowclough (Batley), W. J. E. Bilsate (London), William F. Bird (Mid-Kent Northern), Alfred E. E. Blackburn (Sunderland), Frank H. Brand (Gateshead), W. T. Burns (London), Samuel C. Chapman (Torquay), Walter Clemence (London), A. H. Cooper, W. Valley, E. W. Davies (Nottingham), Fred J. Dixon (Ashton-under-Lyne), Gerald T. Edwards (London), C. F. Gettings (Worcester), Percy Gualtieri (Wolverhampton), [illegible], E. Young Harrison (Guildford), H. C. Head (Winchester), H. Ashton Hill (Birmingham), F. W. Hodson (Loughborough), Alex. H. Jameson (London), W. R. Jenkins (London), Dawson Kitchingman (Southampton), G. W. Loggin (Ceylon), F. W. McCullough (Belfast), C. B. Newton (Hull), Charles Oldham (Ipswich), Charles H. Priestley (Cardiff), E. E. Eccles (Bures), E. J. Silcock (Westminster), C. Clemesha Smith (Wakefield), John Ward (Derby), W. Whitaker (Grantham) and F. L. Williams (New Barnet), members; J. H. W. Arney (Torquay), Alfred E. Drewry (Westminster), J. Edmondson (Manchester), and Fred Hammond (Chepstow), visitors.

The secretary read the minutes of the nineteenth ordinary summer meeting held at Stockport, and these were confirmed.

THE ACCOUNTS.

The PRESIDENT formally moved the adoption of the accounts for 1913 as published in the "Transactions." He said he believed the members would consider them very satisfactory, for a balance had been carried to the accumulated fund on the year's working of £192 0s. 8d. The past year had been the best one they had ever had, and they now at all events seemed to have turned the corner, and he believed in future they would always have a good balance to the report at the end of the year.

The motion was carried.

BENEVOLENT GRANTS.

The PRESIDENT moved "That the members present at this meeting do confirm the decision of the council to sanction the transfer from the accumulated fund of the institution a sum of fifty guineas to the Prince of Wales' War Relief Fund, and a sum of twenty guineas to the funds of the Red Cross Society." He explained that the council had consulted their solicitors as to the legality of making these grants, and were advised that, under sec. 3, subsec. 19 of the Memorandum of Association, the council were justified in subscribing the £21. From the strict legal point there was some doubt as to the power to subscribe to the Prince of Wales' Fund, as it was not strictly an "institution or undertaking." Under the circumstances their legal advisers considered there was little risk of any member objecting.

Mr. C. CLEMESHA SMITH (Wakefield) seconded the motion.

In reply to Mr. E. Y. Harrison (Guildford), the PRESIDENT said the only objection to the grant could come from a member. Every member had received notice that the resolution would be proposed, and no one had objected. If those present voted in favour of it, he took it that all the members were unanimous.

The resolution was then carried.

SYMPATHY WITH BELGIUM.

The PRESIDENT said the members would be glad to know that he had written a personal letter to Dr. Kemna, of Antwerp, offering the heartfelt sympathy of the institution in the trials through which the Belgian nation were passing.

Mr. A. B. E. BLACKBURN (Sunderland) suggested that it would be a graceful act on the part of the institution to vote something to the Belgian Relief Fund, and it was agreed that the council should be requested to consider the granting of a sum of thirty guineas.

ELECTION OF OFFICERS.

The ballot for the election of officers resulted as follows:—

President: Mr. F. W. McCullough (Belfast).

Vice-presidents: Messrs. A. B. E. Blackburn (Sunderland) and S. C. Chapman (Torquay).

Ordinary Members of Council: Messrs. F. J. Dixon (Ashton-under-Lyne), C. B. Newton (Hull), H. Preston (Grantham), C. H. Priestley (Cardiff), E. J. Silcock (Leeds and Westminster), H. W. Woodall (Bournemouth), J. C. Barrowclough (Batley), H. C. Head (Winchester), W. R. Jenkins (London) and C. H. Roberts (Aberdeen).

Mr. F. W. McCullough said he must express his thanks to the members and acknowledge the high honour they had done him in electing him as their president for the coming year. He had been a member of the institution from the beginning, and he did not think any member had more admired its progress. He could offer the members an invitation from the Lord Mayor and the chairman and members of the Water Trust to visit them in Belfast on the summer meeting, and he hoped he would be able to interest them there. He hoped by then that the dreadful war would have spent itself, and that they would be able to come safely across the Irish Channel.

NOTES ON SCRAPING A 15-IN. TRUNK MAIN AT BATLEY.

By J. C. BARROWCLOUGH,
Waterworks Engineer.

The Batley Corporation were originally partners in a joint undertaking, belonging to Batley, Dewsbury, and Heckmondwike, but, owing to increased demands for trade and other purposes, dissolved partnership and obtained Parliamentary powers to construct their present works in 1871. These works consist of three impounding reservoirs, situate on the eastern slope of the Pennine chain, near Holmfirth, about 17 miles of 15-in. trunk main, and a covered service reservoir at Staincliffe, within the borough of Batley. One small village, named Brockholes, is supplied by a branch main direct from the trunk main.

The works were completed ready for turning on water to Batley in September, 1875. The water is obtained from moorland pastures and springs from the millstone grit, being of excellent quality, and, having only 2 deg. of hardness, is exceptionally well suited for dyeing, scouring, &c., in the heavy woollen industry carried on in the borough. There is no filtration or other treatment of the water, except a system of automatic flood-gates, which divert the acid water washed from the peat, particularly after drought, into the lower or compensation reservoir.

In 1890 it was found necessary to construct a new gauge well at the head of the main, in consequence of the reduced quantity of water obtainable from the lower well. The theoretical discharge from this new well was 1,680,000 gallons per day; but when tested in 1893 by the Waterworks Committee with a pressure equal to the level of this new well, the discharge was 1,400,000 gallons. In 1895 the discharge from the same level was 1,387,000 gallons per day. In 1902 the discharge had fallen to 1,347,000 gallons per day. In 1907 the delivery was only 1,262,000 gallons per day. This reduced quantity again caused additional head to be used, and water was delivered from a relief well situate above the level of the lower reservoir.

The author had reported on the condition of the main in 1902, with estimates of cost, both of scraping and of laying a new main, the former being £1,500 and the latter £40,000. Increased consumption and decreased discharge of main again brought the matter forcibly before the council in 1907, when further reports were made, and, having only this one main to supply the town with water for all purposes, it was decided, as a preliminary measure, to obtain an additional supply from one of the neighbouring authorities. An agreement was therefore entered into for a minimum supply of 1,000,000 gallons per week, and a maximum of 2,500,000 gallons per week. This arrangement improved the conditions of supply considerably, and the question of scraping was delayed until 1911. The discharging power of the main at this time was reduced to 1,092,936 gallons

[illegible] and it [illegible] of scraping [illegible].

[illegible] easily manipulated in either direction with little [illegible] over the hills, with the consequent difficulty of [illegible] &c., following with the main body of water, instead [illegible] along by the "pressure-discs," thus reducing mate- [illegible] cups, and are lined with leather buckets, which expand and contract according to the nature of the [illegible]

Illustration of Main Scraper Employed at Bailey.

In the early part of 1912 a trial length, of 2,600 yds. was set out, and hatch-boxes fixed on one of the worst gradients.

[illegible] scraper was inserted at the top of the trial length, near the service reservoir, and the main emptied through the bottom valve, the reservoir being shut in; the hatch-box lid at the bottom of the slope was then removed and the bottom valve opened. The scraper immediately responded, for scarcely had the valve been opened two turns, before the telephone bell at the lower hatch-box informed us that the scraper had started. The first run occupied two hours thirty minutes, and the second run one hour forty-five minutes.

This trial proved so satisfactory that the Waterworks Committee (who were present) gave instructions to proceed with the arrangements for scraping the whole 17 miles of main.

An agreement was entered into by which the corporation agreed to fix the necessary hatch-boxes and to provide labour, and to be held responsible for breakages due to scraping, the author being so confident that this form of scraper would eliminate ordinary risks of this kind that he recommended the corporation to accept this risk, the amount paid for the use of the scraper being on this account reduced by one half.

The work of fixing hatch-boxes was then proceeded with, as occasion permitted—that is to say, that, as there was only a small service reservoir and one trunk main, the work was restricted to holidays and odd week-ends. It may also be observed here that the consumption of water at Bailey is 50 gallons per head per day for trade purposes, and 15 gallons per head per day for domestic supply.

[A section of the pipe-line which accompanied the paper shows the various gradients, and indicates the positions of bridges, hatch-boxes, valves, &c.]

The hatch-boxes were specially designed to meet the varying pressures and different thicknesses of the main. The positions of these required careful consideration, and were determined by three chief factors—firstly, the contour of the main and the positions of valves; secondly, the disposal of sludge and wash-water; and, thirdly, bridge crossings, where flat pipes having two waterways 9 in. by 10 in. each had been fixed on account of the little "cover" available at the time the main was laid. At these crossings it was necessary to fix a hatch-box on each side of the bridge.

A number of these hatch-boxes were fixed. The first length was begun on Christmas Day, 1912, and between December 25th and December 28th the first four sections were completed without accident; some trouble was experienced through multiple-gear valves not closing down tight. Further hatch-boxes were fixed, and between Good Friday and March 26, 1913 (seven days), six sections were completed without trouble, except control of valves. Two pick shafts and a 6-ft. wood crow-bar with iron shoe were brought out of this section. Work was again proceeded with between May 9th and May 14th, and in this section the only cases where the scraper had to be cut out were due to unforeseen difficulties—[illegible] flat pipes having been used to cross a small beck and the last being recorded. The scraper head naturally jammed here and had to be broken out, after which the flat pipes were removed entirely, and circular pipes substituted. On the scraper being again inserted, it travelled to Bradley Railway Bridge, where it quietly came to rest. On opening the ground a reflux valve was discovered, of which there was no record. Owing to the enlarged waterway in the body of this valve, the whole of the available water was passing the scraper heads. The valve disc was removed and the scraper pushed forward by hand, when on closing the lid the journey was completed without further trouble, a total run of 3 miles.

The machine was again taken back to Somerset Bridge, and started for the second run, when all went well until it reached Bradley Canal Bridge, where it was again pulled up. On cutting out it was found that the scraper heads were compressed by long strips of lead, which had been cut from faulty joints during the first run and picked up on the second. One of these pieces of lead weighed 20 lb., and was 4 ft. 6 in. long.

All being made good, scraping had again to be abandoned in order to meet the demands of the town.

December 6th-13th.—The scraper was again inserted at Somerset Bridge and run to the reflux valve, where the lid had to be removed and the scraper pushed forward; on closing the lid the scraper proceeded to Cooper Bridge. Here, owing to the scraper head turning at right angles into the hole cut in the parapet wall of bridge, and thus temporarily blocking the waterway, the water and sludge rose to the top of the footway, and caused about 30 yds. of the wall to slide towards the river. Fortunately it remained in this overhanging condition until it was taken down and rebuilt. The cost of this was £30. Two wood straight-edges, one 9 ft. long and the other 6 ft. long, came out with the scraper at this point.

The next section was completed without trouble. From February 6th to 8th the work was finished without further accident or trouble, the scraper having been through all sections twice and some sections three times.

With the exceptions above named, the work was carried out without accident. Not a single case of a fractured main or blown joint occurred in the whole 17 miles. Air valves were not closed down, and were observed to close gradually and without shock as the scraper passed them, due, no doubt, to the low head of water used for propelling the scraper. The speed of the scraper was controlled to a walking pace, and was distinctly audible in most places without stethoscopes. To facilitate the control of valves, &c., a portable field telephone apparatus between hatch-boxes and valves proved of great service.

The amount of incrustation was ascertained by weighing various sections cut out when fixing hatch-boxes, and averaged 28 lb. per yard, or 22 tons per mile. No difficulty was found in disposing of this material, which passed away as sludge with the wash water. No complaint was received, except from the small village of Brockholes, which was unavoidably without water at times during the scraping of the earlier sections; the town supply was fully maintained without dirty water or inconvenience of any kind.

The delivery of the main which, before scraping, was 1,092,936 gallons per day, was increased to 1,527,462 gallons per day. This will be further increased when certain flat pipes and other obstructions have been removed.

The cost of the work was as follows:—

	£	s.	d.
Hatch-boxes and fixing. (Capital) ...	650	0	0
Scraping, including loan of scraper. (Maintenance)	600	0	0
Total ...	£1,250	0	0

Cost per yard for [illegible]	[illegible]
Cost per yard for scraping, &c. ...	[illegible]
Total cost per yard	[illegible]

[illegible] ing. The air valves are double, and have screw-down valves.

[illegible]

Cost of land, &c.	[illegible]	[illegible]	[illegible]	[illegible]
Parliamentary, compensation, commission, &c. ...		329	0	0
Laying ...		16,5[illegible]	0	0
Total		£17,482	0	0
Pipes, &c.		50,000	0	0
Total		£67,482	0	0

[illegible]

Construction, &c.	17,482 say	0 11 8	per yard.
Pipes, &c. ...	50,000 ,,	1 13 4	,,
Total	£67,482 ,,	£2 5 0	,,

The increased capacity of the main resulting from the scraping has not only enabled the author to reduce the general working head, but to utilise certain leakage from reservoirs, which was previously lost.

It is impossible to lay down hard-and-fast rules for pipe scraping, but the following observations may [illegible]

(1) The main should be carefully surveyed, and all possible information obtained as to the position of valves, special castings, &c.

(2) Where the main passes through private land it [illegible] as to its position [illegible]

(3) Hatch-boxes should be fixed as near to controlling valves as possible, and provision made in the lids for fixing pressure gauges, &c.

(4) The author (after the trouble experienced with [illegible] would prefer ordinary valves with by-pass valves attached.

(5) Ample outlet for sludge and wash water should be provided, and the main should be flushed out after each run.

(6) By scraping down gradients instead of up them danger of damage to main is much reduced.

(7) The degree of success attained will materially depend upon the care devoted to the preparations made in advance, and a full appreciation of difficulties likely to be met with, and perhaps the most important factor is a willing, cheerful and intelligent staff of workmen, ready to face difficulties and delays, together with an abundant supply of tools and tackle.

DISCUSSION OF MR. BARROWCLOUGH'S PAPER.

Mr. F. H. BRUNT (Rochdale) said that one point [illegible] the paper was the after-effects of the scraping on the quality of the water. He [illegible] of several cases where the process of scraping, both by power and hand driven machines, had been very successful in increasing the delivery of the mains, but discoloration of the water, due to the presence of finely divided particles of oxide of iron, had afterwards resulted. He was speaking particularly of towns using moorland water. Although the mains were continually flushed, the discoloration was always more or less present until the mains were eventually renewed. He would be glad to know if Mr. Barrowclough had had any trouble of this description. In cotton manufacturing districts the presence of oxide of iron in the water would cause considerable loss to spinners by producing iron stains on yarn, which would, he believed, render the yarn unsuitable for making anything but black cloth. From the experience already gained, he would therefore hesitate before recommending the scraping of mains in such districts. He had known cases also where steam laundries had complained for more than twelve months after mains had been scraped, and the only remedy was [illegible] tioned the amount of incrustation, and he would like to know what was the thickness of incrustation in the main, and also whether there was any trouble due to ferrules projecting into the main.

[illegible] read that day there was a price given for pipes which in no way compared with that of Batley. As regarded the scraping itself, he did not think Mr. Barrowclough had shown any reason for the [illegible] 14 miles of 24-in. main with the Kennedy scraper under very difficult circumstances, and they had [illegible] out, and it was successful throughout. He did it [illegible] Glamorganshire Canal and the river Taff the main was 14 ft. to 18 ft. deep. In scraping a large main, over 18 in., there was nothing like the same facility as in scraping a smaller main. For the purposes of comparison, he might give his cost, but he could not give it in the detailed manner of the author. The total cost was £7,200, but that included a good many incidentals, such as meters at both ends, and a certain amount of main relaid, and also the whole of the hatch-boxes required and the machines, which they bought outright. The total cost of the section, [illegible] Mr. Barrowclough's, was only £54,000. The main was laid in 1886-7, and he knew the price at that [illegible] laid the price of iron was much higher. Still, the price given by the author was high. The increased delivery of these 15 miles of main was something like 1,250,000 gallons, and he considered it very successful and well worth the money spent on it. To [illegible]

Mr. [illegible] Torquay [illegible] "Hydraulics" as follows: "A notable case of this kind occurred at Torquay, where a main about 14 miles long, composed of 14,267 yds. of 10-in., 10,085 yds. of 9-in., and 170 yds. of 8-in. pipe delivered only 317 gallons per minute, with a head of 465 ft. . . . By Prony's rule (32) the discharge comes out 616 gallons. The experimental discharge was therefore only $\frac{317}{616} = \cdot 51$, or 51 per cent of the theoretical; or, in round numbers, the discharge was that due to one-fourth of the head, so that three-fourths of the head were lost in undue friction. An ingenious scraper, suggested by the late Mr. Appold, and worked by the pressure of the water, was passed through the entire length of the pipes; and subsequently an improved one by Mr. W. Froude, was used with remarkable results, the discharge being increased to 564, and eventually, by repeated scraping, to 634 gallons, which is 18 gallons, or 3 per cent, more than the theoretical quantity. Errors of observation, or in the reputed sizes of the pipes, may account for the discrepancy." He might say that the main referred to was completed in 1858, and was first scraped in 1866, and during these few short years it had lost 61 per cent of its capacity. Annually since that time the main had been scraped. The first scraper used was very much like the Glenfield scraper, and then followed the scraper made by Froude & Box. That was tried for a short time and abandoned, and then the one made by Mr. Froude, and referred to in the extract he had read, was used, and was in use at the present time. It differed very largely from other scrapers, and worked without trouble or hitch. There were several points which one could comment upon, and one was the severe gradients mentioned by Mr. Priestley. With their pipe track they had many parts on which there were gradients of 1 in 3, and they always worked up these gradients, and the scraper took them as easily as a motor car took an ordinary hill. With regard to working in other directions, he did not see that there was anything very much to be gained in that. They scraped annually, and never had any blown joints or split

pipes and he thought a good deal must depend upon the condition of the main itself. With regard to the pressure heads being placed in front of the ploughs, he did not think there was anything in it, for this reason: If the pressure heads were in line to the circumference of the main, then the scraper would fail to drive along. One would infer, therefore, that the pressure heads did a large portion of the scraping, and the plough which followed after simply took up such things as the pressure heads might leave behind. With regard to the question of getting rid of the *débris*, he did not think it was one which need be considered with any seriousness, because if the wash-outs were open at the low points, then, as the scraper travelled along, the whole of the *débris* was washed out, and there would be no trouble with any accumulation in front of the scraper. He got no trouble with his scrapers. They ran right through, and when they came to the end there was practically no *débris* to take out. Of course, they had to close the wash-outs after they had passed them. The author had referred to the scraper turning at right angles at Cooper Bridge, and he could quite understand that, because if they looked at the drawing they would see that the axis of the scraper was so short that when it came to any opening fairly wide it would tend to turn sideways. Nothing of that kind could happen with a scraper of another design. As to discoloration, they had scraped the Torquay mains annually for a great number of years, and there had been no trouble at all from discoloration. They did find, however, if they scraped one of the smaller distributing pipes, where the flow of water was not so great, that discoloration occurred, and, although he had scraped small pipes in the past, he did not think he would do it again.

Mr. Priestley remarked that he had had no trouble whatever from discoloration if the main was properly washed out.

Mr. Brunt: That applies to drinking water only.

Mr. Priestley: Yes.

Mr. F. J. Dixon (Ashton-under-Lyne) said Mr. Chapman had not told them whether each side of the pipe was coated or not.

Mr. Chapman: Uncoated.

Mr. Dixon said that made a great difference. If the pipe had been thoroughly coated it might have been thirty or forty years before it needed scraping. He wondered whether Mr. Barrowclough had ever considered the question of treating the water before it entered the main. Although the author had obtained an increased discharge equal to 44 per cent. he (the speaker) was of opinion that in five years or less he would have to scrape again. He had just scraped about 6 miles of 18-in. main. Some years ago he scraped 6 miles of 18-in. main, and after two years found it necessary to scrape again. In the first case the increased capacity was equal to 27 per cent, and, judging by the discharge now, he had lost 10 per cent. On the strength of his opinion that Mr. Barrowclough would have to repeat the scraping in five or six years' time, he suggested that it would have been advisable for him to have purchased his ferret right out, and so reduce his costs in subsequent scrapings. He had scraped some small mains badly incrusted, and after visiting Batley he adopted the Power machine. Mr. Barrowclough was one of the first to use the Power machine, and he would like to know why he did not use it in preference to the Eric in the operations he had described. His own experience of the Power machine was disastrous, and the discoloration lasted for months, especially on distributing mains. The Manchester Corporation were considering the question of doing a lot of mains, and their engineer came to him to see the result. He asked to go into a house where they had scraped the mains, and on turning on the tap the water came out highly discoloured with oxide of iron. He found discoloration now, after three years, and the only way in which he could remove it was by having a hydrant at the end or intermediate running continuously, so as to keep the water moving. As regarded cost, he had prepared a paper which he would hand in to be included in the minutes. His experience was that damage was caused to the pipes by the action of the Power machine, and he was now experiencing breakages due to its use. He had used the Kennedy scraper for the trunk mains, and he preferred it to the Eric. Mr. Barrowclough said he had had no accident or breakdown, but he referred to the scraper heads being compressed by long strips of lead. Personally he preferred to work in front of the power, especially in highly encrusted mains, because where the plough or ferret was in front of it it had a tendency to work in revolving, and eat itself through. In the case of the Eric it did not, as the pressure discs were in front, and he considered were more likely to become jammed than was the Kennedy scraper. When the Kennedy scraper encountered a tongue of lead it broke it off, and allowed it to pass the pressure head, whereas he was of opinion that the Eric scraper would not. The speed of the scraper was somewhat slow at Batley, and he saw that the incrustation was very heavy. He felt, however, that the method of estimation was not absolutely accurate, because his experience showed that incrustation was greater where the velocity was greater, and consequently it was hardly fair to take the hatch-boxes, where the velocity was great, as an average for the 17 miles. The amount of incrustation he had found in his 18-in. main was equal to 10 lb. a linear yard. He had to scrape flat pipes by hand scrapers. Originally he did not do so, and he found the discharge not what he expected; but after hand scraping he got an increased discharge of 27 per cent. He would like to know what loss of capacity had taken place at Batley since the scraping was done. The question of incrustation was very interesting, and there were several works on it. He was looking at the discussion on a paper read by Mr. Rideal, junr., and it was stated that, in the case of steel pipes laid across the Tay Bridge thirty-one years ago, there was practically no incrustation six months ago. In the case of the Nidd Valley works, Mr. Watson stated at Glasgow two years ago that with the cast-iron pipes there was incrustation of about 1¼ in. all round, whereas in the steel pipes there was no incrustation whatever, or only a very black slime. This showed that so long as the surface was smooth, with a good coating, there was no trouble. He believed there would be little trouble with incrustation if a coating was very carefully prepared and applied to the pipes.

Mr. W. R. Jenkins (London) asked if any gaugings were made immediately after the main was laid in the first instance. The author told them that the theoretical discharge in 1895 was 1,680,000 gallons a day, but that, he took it, was when the main was twenty years old. Working the discharge out by Hayes & Williams' formulæ that gave a discharge of the new main as 2,400,000 gallons. The discharge of 140,000 gallons a day was about 58 per cent of the discharge according to the Hayes and Williams' formulæ for a new pipe. It would be interesting to know how far the discharge of the main, when it was originally laid, corresponded with that formulæ, and what proportion of the original discharge was regained by scraping.

Mr. A. B. E. Blackburn (Sunderland) said he would like to ask when it became economical to scrap instead of scrape, and also what was the smallest size of main which could be economically scraped with this kind of scraper. It seemed to him some engineers had very bad water to deal with, and especially the Torquay district, where the mains had to be scraped every year. It would, he considered, add to the interest of the paper if Mr. Barrowclough could also give an analysis of the water. In Sunderland he had never yet had to scrape a main, and did not think he ever would. The mains were fifty or sixty years old, and there was a little incrustation, but not a great deal. He would like to know the minimum pressure necessary to drive the scraper.

Mr. H. Ashton Hill (Birmingham) said Mr. Blackburn had rather anticipated his remarks. The collection of articles the author got from the main would make a nice museum, but he had not got the barrowloads of macadam which he had found under similar circumstances. In one case he had the macadam acted as a sort of valve, which led to the consumers getting no water. When, however, the inspector went round the next day, the macadam had fallen back and the water supply was all right. With 22 tons of incrustation per mile an interesting question was as to how many tons went through the consumers' taps each year, and an analysis of the water would show that. He was wondering whether it would not be more economical to put up a filtering plant to take all this solid matter out of the water. If it was not cheaper it certainly would be better. With regard to the point raised by Mr. Dixon they had to take into account not only the quality of the water, but also the quality of the steel. He was at some works in Birmingham where they dealt with water supplies to public institutions, and saw some pipes which had

been taken up and were not corroded up, but were eaten through. He saw there a tank the sides of which had been eaten through, while the bottom was all right, and on calling attention to that he was told the bottom was a different steel. It seemed, therefore, unless they had an analysis of those things they must not generalise or dogmatise too much.

Prof. A. H. Jamieson (London) asked the author the levels of the inlet of the small tank from which the water was drawn, as this would be a useful record of the falling off. It seemed to him they could learn useful lessons as to testing small mains in the future, and one would be to get contractors to run a scraper through before the mains were accepted. Another thing was that the expense of scraping would be considerably reduced if hatch-boxes were put in at the beginning; £600 was a small item in £60,000 of capital expenditure, but a considerable item to add to revenue. One advantage of having ploughs in front of the pressure discs was that the water passing in the ring, including spaces round the discs, had a considerable scouring power. He would like to know if the author weighed any of the pipes after scraping, and could tell what the loss of weight was. The amount of incrustation was very large indeed, and must have affected the quality of the water. As to discoloration, was it not possible that it was largely a sediment in the surface pipes, and that if the surface pipes were cleared out before the scraping was done, a good deal would be avoided?

Mr. W. J. E. Binnie (London) said the rate of falling off in the discharge capacity of the main after eighteen years appeared to be 17 per cent, while in twenty years the falling off was 17·4 per cent. In twenty-seven years it was 20 per cent, in 1902 25 per cent, and in 1907 the falling off was apparently 35 per cent. Apparently, therefore, in four years the falling off jumped from 25 to 35 per cent. As a rule the discharging capacity fell off very gradually. His firm was called in by the Western Australian Government to investigate a case of failure of a big main at Coolgardie, and one conclusion they came to was that it was air in solution in the water which was one of the factors in a chain of chemical action before incrustation took place. They found that at the points where the air became disengaged the incrustation was most. This would again follow in places where the velocity was highest. Where the static pressure fell off there again they would find incrustation. One of the recommendations they made to the Western Australian Government was to remove the air and to add 3 grains of lime to prevent very soft water.

Mr. H. C. Adams (Newmarket) said the most important hint in the paper was the last paragraph, which was that if success was to be obtained by scraping, there must be full appreciation of the difficulties to be overcome. In the course of his wanderings he had come across an unduly large number of cases where scraping had been a disastrous failure. There had been more in country districts, where the people had been dependent upon commercial rather than expert advisers, and had entered into such schemes and been sorry afterwards. But there were many cases where it had been successful, and the troubles which had been enumerated to him he was sure could have been overcome by carefully considering the problem beforehand. A short time ago he carefully examined a stack of pipes representing a mile or two which had been taken up because they were badly incrusted. All the pipes were made at the same time by the same firm, and had carried the water the same number of years, but the incrustation varied within very large limits. On looking into the matter closely he came to the conclusion that the evidence distinctly showed that the incrustation varied with the perfection of the coating. Some pipes which were well coated showed little trace of incrustation, while others badly coated were almost choked up. The special castings, and the junctions particularly, were incrusted worse than the straight pipes. The velocity through the junctions would be greater than through the straight pipes, and at the same time the coating was infinitely worse in the special castings than in the straight ones. On removing the nodules, in the majority of cases, he found a pinhole through the coating which exposed the iron underneath. It seemed fairly obvious that if that nodule was removed the water had a more favourable chance of attacking the iron than if it was left in, and that seemed to show that when they once scraped a coated main attacked in that way the chances were that they would have to scrape it periodically. Of course, coatings were not always formed of oxide of iron, and if it was formed of something independent of iron, then his argument of having to scrape again would not apply.

Mr. James A. Hutchinson (Paignton) sent the following remarks, being unable to attend the meeting: "I have recently finished scraping an interesting section of 9-in. main, 17 miles long, and have had a variety of troubles. The scraper I first used get stuck and badly damaged, and as the work was urgent, Mr. Chapman, of Torquay, very kindly lent me his to get mine out and to finish with; this one stuck within a mile of the start, and for the first six miles frequently stuck for a long time. I was thirty-nine hours scraping the first 6 miles, the work being continuous. The 17 miles was eventually scraped in seventy-five hours between the Wednesday morning and the following Sunday morning. The whole of the 17 miles had been scraped before, part last year and part the year before. The lead taken out from this 17 miles has been altogether about 4 cwt., also stones (some about 4 in. thick), sand, gravel, bolts, and lumps of iron, all in addition to a very large quantity of corrosion in nodule form. At first examination the condition of the coating after the removal of the nodules appeared to be excellent, but on closer examination I was found that the coating was punctured under the nodule, and the whole of the surface of the iron under the nodule attacked and the iron removed, and only a graphite form of carbon left. The depth to which this change had taken place was in some cases as much as ¼ in., and the outline of the area attacked coincided almost in every case examined with that of the nodule which had overlain it. The pipes came from France, and are extremely hard and tough, and were jointed by first caulking in a ring of lead and then running with hot lead and caulked after. The water is derived from a peat gathering ground in the heart of Dartmoor, and contains several bad peat bogs, where horses sometimes are trapped and die; these bogs are being drained. The total hardness of the water is about 3 deg. after passing through a battery of pressure filters containing a bed of magnesium oxide for hardening purposes. The water contains only a trace of iron before filtration and none after. The theoretical discharge of the main is about 618,000 gallons per twenty-four hours; before scraping this year the discharge was 540,000 gallons per twenty-four hours, and since scraping I have got as much as 689,000 gallons through in the twenty-four hours after the main had had time to settle down. The usual discharge since scraping has been 666,000 gallons per twenty-four hours. I may mention a curious fact—the delivery of the main is greater now than when first laid down about ten years ago; this is probably due to the amount of lead which had got in."

Mr. C. Clemesha Smith (Wakefield) said that in an interesting paper on the incrustation of pipes read by Prof. Campbell Brown before the Institution of Civil Engineers, the author seemed to infer that incrustation took place more readily where the water was acid in nature. In most of these cases the water was peaty and acid. In his own case, where the water was extremely acid in its raw state, they had had trouble. Some years ago they put in a Venturi meter, and after some time it was found to work very irregularly. They were aware that the meter had to be cleared of air from time to time. They found they had to open the cocks and discharge the air once a day, and after a while there was so much air that the meter would not work properly. On taking it down they found that the part made of aluminium was eaten away by the action of the acid water. It showed that a considerable effect took place where they got two metals in contact with acid water. It had been found where they had these nodules that the coating had been penetrated underneath, which seemed to be due to the fact that in coating small bubbles of air or gas were underneath the coating and formed a small aperture. In laying mains last year he tried the experiment of having the coating applied twice, so that if bubbles formed the probability was that they could not get one over the other. They would see in future whether that would be effective.

Mr. H. C. Head (Winchester) said that, as most of them were water engineers only, they might not be familiar with the method of laying gas mains. In the past gas mains were stopped up with bags, but recently they had been stopped back with what was called the gas-main stopper, which consisted partly of a rubber disc. The rubber disc filled the pipe quite closely, and as each main was laid was pulled for-

[illegible] at first, there was exceedingly rapid incrustation. [illegible] but how did he work the gradient approaching Riding Wood [illegible] sure working down that gradient. The cost of laying the main seemed to be exceedingly high, although it [illegible] know how many years it would be before the author thought he would have to scrape again. Nothing had [illegible] in situ. He wondered whether that had ever been tried after scraping so as to try and stop the main becoming incrusted again. He should think it would not be beyond the water engineer to devise something to do that. He took it from the author's opening remarks that he would agree if the water had been filtered in the first instance the corrosive action could have been neutralised, and personally he would suggest that Mr. Barrowclough should seriously consider the question of filtration now. Perhaps, also, Mr. Barrowclough might tell them what difference there had been in the delivery between the time he had taken the flat pipes out and now.

Mr. Barrowclough, in reply, said they had had no trouble at any time from discoloration of water owing to scraping. They had a large calico-printing works and several steam laundries taking water from them, but at no time had they received any complaint of discoloration of the water or of any damage to the fabrics. There were no lead surfaces on this trunk main. The thickness of incrustation where the pipe was cut was about 1½ in. in the heading, and consisted largely of oxide of iron and some sand and peat. He was sorry he could give no details of the cost of the field telephone, but it was not expensive. The contractor provided it, and he arranged with the local telephone people to utilise the telephone posts along the highway on which to sling the wire. The weight of the incrustation was ascertained from the sections taken out. A yard was carefully measured, and the whole of the incrustation weighed. Six sections were taken out in the whole length of the pipe, and the average came out as stated. He agreed that the cost of the main was heavy, and the pipes themselves cost £50,000. At the time cast iron was £9 per ton. As to the Eric not being preferable to other scrapers, of course all these things were matters of experience and opinion, and his only reason for adopting that form of scraper was because he was satisfied there was an advantage in being able to work the scraper with considerably less head than was required for a scraper where they had to drive it with discs behind. The whole of the available head was used in this form of scraper, whereas in the disc scraper a certain amount of slip-by water was allowed, which meant that they must work with very big heads. The second reason was because there was no danger of being blocked in by incrustation, which he had experienced with other forms of scraper. They had nothing very serious in the way of gradients, but he felt it was an advantage to work with less head wherever it was possible to do so, and they could work with less head if they came down a gradient. On the first trial section they worked with practically no heading at all. As to the *débris*, he considered it was better to get it out at the bottom of a slope than to force it over a hill. The reason for the scraper turning into the parapet of Cooper's Bridge was owing to the scraper touching a stone flange at the side of the opening. On the first two runs nothing of the kind occurred, but on the third run they found the flange displaced. The question of treating the water was under consideration, and he would like his committee to accept his views, but they had a very big trade interest involved in the water supply, and the traders were afraid that if they began to tamper with the water, which was excellent for all purposes, they might make it worse. He was of opinion that in five or six years [illegible] He had come to the same conclusion as Mr. Dixon, that the Power machine driven by a lateral motor was too stiff in its action. The question of the cost [illegible] might say he was doing 3-in. and 4-in. mains by a hand scraper at 6d. per yard, including depreciation [illegible] not due to any fault of the scraper, but was owing to the contractor's mechanic putting on the front head by accident before the blades had been tempered, with the result that the front head settled on its side and allowed the water to pass the heads. This resulted in crushing, and made a certain amount of passageway for the water which reduced the pressure. They could have driven it forward by putting on additional pressure, which was quite simple, but they considered it a convenient place to cut out and see what occurred. All the flat pipes had not been taken out, so that he could not give the figures of the discharge asked for. He had no information as to whether any gauges were taken after the mains were laid. In reply to Mr. Blackburn, the question of when it was advisable to scrap depended on circumstances. The fact of a main like his costing £50,000 being made to discharge almost its full capacity at a cost of £2,000 was a very material thing to consider; but with very small mains one would naturally prefer to scrap rather than scrape. At the same time with a hand or power scraper they could do it at little cost. He would put in an analysis of the water, which was a moorland water slightly on the acid side, and containing a little iron. As to minimum pressure they depended more on suction than pressure behind, and they frequently worked with not more than 20 lb. or 25 lb. indicated on the pressure gauge. He agreed that records should be kept, and probably they had been kept at Batley, but they were not handed down to him. He also agreed that it was better to put in hatch-boxes at the beginning, and particularly in dealing with moorland waters would this be an advantage. It was impossible to give the weight of a pipe after it was scraped, because they had been so successful that there was no reason to cut out a section. The rate of falling off in the discharge of the main was very irregular, and he had really no reason to give why it should be so. He agreed with Mr. Smith as to a second coating probably leading to the lengthening of the life of a pipe.

(To be continued.)

SEWAGE WORKS TENDERS.

DEWSBURY COUNCILLOR'S COMPLAINT.

In the course of the last meeting of Dewsbury Town Council, Councillor Garforth complained very strongly of the decision of a committee not to return to the contractors the priced schedules of quantities which accompanied their tenders for the sewerage contract at Mitchell Laithes. He contended that the committee was weakly constituted if it simply acted on the advice of Mr. Diggle, their expert.

Councillor J. Oldroyd remarked that the tenders had been sealed and put away. Evidently they were no good to the corporation, and he suggested that they should be returned to the contractors.

Alderman Gledhill admitted that the committee acted on the advice of Mr. Diggle and the town clerk in the matter, but it was an insult to suggest that in consequence of that fact they were a weak committee. Cases mentioned by Councillor Garforth were not parallel with the Dewsbury case, where they were going to do the work by administration. The tenders had been sealed up and put in the safe out of the sight of everybody. Alderman Gledhill proceeded to quote the opinion of the law editor of The Surveyor on the subject, which was to the effect that the committee had acted within their rights.

The minutes were confirmed.

Institution of Municipal Engineers.—A largely attended meeting of this body was held at Manchester and Salford on Saturday last. The proceedings—which will be fully reported in our issue of next week—opened at the Mitre Hill, Manchester, and included visits of inspection to the Salford Corporation flag-making and electricity works.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING: NEXT YEAR'S PRESIDENT.

At the [illegible] council of the Institution of Municipal and County Engineers held on the 4th instant, there were present: Messrs. J. S. Pickering, [illegible] (in the chair), A. [illegible], W. N. Blair, J. S. Brodie, G. [illegible], J. W. [illegible], A. E. Collins, E. [illegible], A. D. Gibbs, W. Halpin, J. W. A. Hargreaves, W. F. [illegible], E. B. Martin, J. Mason, P. H. [illegible], W. H. [illegible], N. Scott, R. J. [illegible], H. [illegible], C. F. Wike, O. F. Wood, [illegible] and the secretary.

NEW MEMBERS ELECTED.

The following candidates were elected:—

Members: Messrs. W. A. Barth, [illegible] to [illegible], Lambeth, and W. Ross Young, town planning engineer, Lanark (Middle Ward).

Associate: Messrs. R. J. Brodie, assistant paper to county surveyor, Cumberland, Carlisle, and G. S. Hebden, engineer and surveyor's office, Goole.

Transfer from Student to Associate-member: Mr. G. Kershaw, engineering assistant to borough engineer, Islington.

UNIFORMITY OF TENDER FOR SANITARY PIPES.

The council decided to support the proposal of asking for tenders for sanitary pipes at a discount off the Standard Gross List prepared and published by the Midland Pipe, Northern Potters' and Devon and Dorset Sanitary Ware Manufacturers' Associations, and obtainable from Mr. W. H. Facon, secretary of the Midland Pipe Association, in view of the reduction of clerical work and simplification of classification rendered possible thereby.

PRACTICAL TRAINING OF ENGINEERS.

It was resolved that a sub-committee consisting of Messrs. J. Patten Barber, J. S. Pickering, J. A. Brodie, S. S. Platt and W. H. Prescott be appointed to consider and report on the Report on the Practical Training of Engineers issued by the Institution of Civil Engineers.

RECOGNITION OF DIPLOMA.

It was resolved that the Diploma in Municipal Engineering granted by University College, London, be recognised for the purposes of By-laws 1 (*b*) and 2 (*b*).

VOTE OF CONDOLENCE.

It was also resolved to pass a vote of condolence with the family of Mr. H. Card in their bereavement. The late gentleman, as noted in our columns recently, held the post of county surveyor of Sussex from 1868 to 1898, and died at the advanced age of ninety-six.

NOMINATION OF PRESIDENT FOR 1915-16.

It was resolved that Mr. H. T. Wakelam be nominated president for 1915-16.

Mr. Wakelam received his professional training through the ordinary routine of pupilage with the late Mr. Benjamin Baker, the then borough engineer and architect of Wolverhampton. On the expiration of his articles in 1879, he was appointed assistant under Mr. Baker, holding that office for about two years, and was then elected assistant borough engineer of King's Lynn. In February, 1881, he was appointed as resident engineer to superintend a new sewerage scheme for King's Lynn under Mr. W. H. Wheeler, M.INST.C.E., being also engaged on the town hall and other buildings. He left King's Lynn in 1883 on his appointment as borough and water engineer of Oswestry, a position which he held until 1888, when he became engineer and surveyor of the Garston District, Liverpool. In 1892 he was elected county surveyor of Herefordshire. To his present post he was appointed in 1898, receiving the appointment of county engineer by special resolution of the county council in 1900. Mr. Wakelam is a member of the Institution of Civil Engineers, and a Fellow of the Geological Society, and is the author of many contributions to scientific bodies and journals.

Lincoln City Improvement Schemes. A special meeting of Lincoln City Council last week passed a resolution in favour of the Bill which the corporation is promoting in Parliament dealing with commons, the provision of motor omnibuses and trolleys, extension of the electricity plant, gas and water and sanitary matters.

ACHORUTES OR "PODURA" OF SEWAGE FILTERS.

By J. W. Haigh Johnson, B.Sc., F.I.S.,
Chemical Biologist, West Riding of Yorkshire Rivers Board, Wakefield.

I was particularly interested in Mr. G. B. Kershaw's communication on this subject, under the title of "Some Notes on Achorutes purpurescens," which appeared in a recent issue of your journal [November 13th].

Some time ago I devoted a considerable amount of attention to the examination of these insects; they were obtained from widely separated sources, and the following notes on this investigation may be of interest.

The literature dealing with these insects from a sanitary point of view is very scanty, and opinion seems to be divided as to their identity. The scientific titles of *Podura aquatica* and *P. tullbergii* have both been claimed by various writers on behalf of these well-known insects of sewage installations. With this in mind, I was greatly surprised to discover that the insects did not even belong to the genus Podura, but to the closely-allied one of Achorutes, the feet having two claws, instead of a single one, which characterises the former genus. With the aid of Lubbock's Monograph of the Collembola and Thysanura, I was at first inclined to regard these insects as *Achorutes purpurescens* of Lubbock, but the agreement with his description of that species was not satisfactory.

Since Lubbock's Monograph was written (1873) much valuable work has been done on this neglected group of insects, and the species now under consideration appears to be chiefly *Achorutes viaticus*, as described by Tullberg in 1872, and may agree with *Podura viatica*, Linnæus, 1746. This insect was apparently unknown to Lubbock when he wrote his Monograph, as he gives no description of it; there is, however, a scanty and inadequate description in the original French of *Achorutes murorum* Bourlet, which may refer to the present species.

The most recent systematic account of these insects is given in W. M. (Axelson) Linnaniemi's work, "Die Apterygotenfauna Finlands," Parts I. and II. In this work the insect appears under the new title of *Hypogastrura viatica* (*Tullb.*), but as the generic name of *Achorutes* is better known to British entomologists I have retained it in the following comparison and description. *A. viaticus* and *A. purpurescens* are very similar; the small capitals serve to emphasise the points of difference between them.

A. viaticus. Mucro (i.e., terminal portion of saltatory appendage), BROAD, with BROAD inner lamella. Colour generally BLACK.

A. purpurescens. Mucro TAPERING, with NARROW inner lamella. Colour, REDDISH.

A. viaticus. Antennæ 4 joints, the fourth having a RETRACTILE TERMINAL PORTION. Eyes eight on each side of the head. Upper claw, with an inner tooth a little beyond the middle (as in purpurescens), with a lateral tooth on each side near the DISTAL end. Lower claw bristle-like, reaching to the tooth of the upper claw, with an inner lamella about half its length. Anal horns MORE SLENDER than in purpurescens, slightly curved, LONGER than the papillæ on which they stand. Papillæ SEPARATED at the base. Mucro with a BROAD, toothed lamella. Colour generally deep blue BLACK.

Lighter coloured specimens often occur, and are most frequent in recently moulted examples.

During these investigations specimens were obtained from several sewage filters in the West Riding of Yorkshire, and also from Harrow-on-the-Hill and Stratford-on-Avon. In all these cases the insects were chiefly *Achorutes viaticus Tullb.*, and later I was gratified to find that material from the last-named place had been previously so recorded by local entomologists. Prof. G. H. Carpenter, who kindly examined several of the above specimens, also informs me that this species is common in the Dublin outfall sewers. This insect usually feeds upon the slime which develops on the filter material of sewage filters; this slime consists chiefly of a bacterial zoogloea (*Z. ramigera*), débris, and other fungi. At Harrow-on-the-Hill the insects fed upon the green thalloid alga, *Prasiola crispa*. This alga, like the *Ulva latissima* of the sloblands of Belfast Lough, rapidly absorbs the nitrogenous pollution in sewage, and thus provides a rich food supply for these insects.

A Recent Development of the Sewage Problem.*

By EDWARD ARDERN, A.M.S.C.E.

[illegible] that [illegible] in regard to the character of the [illegible] and the difficulty [illegible] the design of a purification [illegible] so far as the oxidation of purification of the organic matters in solution is concerned. In fact, it may be said that the opinion is largely held that the sewage problem has already been solved, on the ground that in many cases the question of the disposal of the resultant sludge constitutes the chief source of considerable difficulty.

Many years experience with various types of sewage purification plants have rendered it possible to state with considerable accuracy the purification capacity of any particular type. In this respect the researches of the Royal Commission on Sewage Disposal have been invaluable. It follows, therefore, that, having determined the type of purification plant most suitable for any particular sewage, the question is largely resolved into a mathematical or mechanical proposition as to the manner in which the requirements of the Local Government Board are to be complied with.

The subject of sewage purification was thus fast losing interest from the point of view of the research chemist, as, apart from the question of sludge disposal, apparently advances were mainly to be looked for in the direction of mechanical improvements designed to effect a more economical and efficient distribution of the sewage. The opinion may, however, be ventured that the present-day methods of sewage purification by no means represent the final solution of the problem, and it is submitted that the evidence given in the following communication is such as entirely to alter the present aspect of the subject, and to render it more or less certain that very considerable advance in connection with this question of sewage purification may be confidently anticipated in the near future.

As an introduction to the consideration of this new development of the sewage problem, the following extract may be quoted from a paper† entitled "Experiments on the Oxidation of Sewage without the Aid of Filters," by W. T. Lockett and the present writer:

"It has long been known that if sewage be exposed to the air for a sufficient period of time the organic contents are gradually oxidised with the formation of a deposit of so-called 'humus,' and the final production of nitrate from the ammonium salts and the nitrogenous organic matter. This purification change, of which the course of the reaction has been so carefully studied and thoroughly worked out by Adeney in his researches on behalf of the Royal Commission on Sewage Disposal, takes place, however, comparatively slowly, and even if aided by direct aëration by no means becomes a practical method of sewage purification.

"Numerous investigators have from time to time endeavoured to utilise aëration methods in the practical solution of the sewage problem, but until quite recently without any reasonable amount of success. Among the earlier investigations may be mentioned those of Dupré and Dibdin‡ on the aëration of London sewage, and those of the Massachusetts State Board of Health relating to the use of aëration in the filtration of sewage through gravel and sand filters. Dr. Brown,§ chemist to this board, concluded from the results of a series of experiments that the oxidation of organic matter in water was not hastened by vigorous agitation with air. Waring,¶ of the United States, was one of the first to apply aëration methods in the purification of sewage on a working scale. In 1886 Hartland patented an aëration chamber for the purification of sewage or tank effluent, which Kaye Parry‖ employed in experiments undertaken in 1887. In a 1892 Report on the results of experiments on the aëration of filter-beds by a forced air supply. In the latter year Mason and Hine* published the results of a series of experiments on the treatment of sewage and water, in which they concluded that aëration had but little oxidation effect on the sewage. In 1897 Fowler† investigated the effect of aëration on the effluent resulting from the chemical precipitation of Manchester sewage without any very tangible results being obtained, at any rate, as far as the total amount of oxidation was concerned.

It would thus appear that the results of the earlier investigations on the subject, i.e., aëration of sewage, indicated that aëration *per se* could not be considered as a practicable adjunct in the process of sewage purification. Recently, however, the subject has been reopened by the work of Black and Phelps, Clark, Gage and Adams, and Fowler and Mumford. In dealing with the question of the pollution of the New York Harbour, Black and Phelps‡ studied the possibilities of the application of aëration to the treatment of sewage. Their experiments dealt with the aëration of both fresh and partially septicised sewage in various types of tanks, and it was shown that, under certain conditions, it was possible by means of a reasonable amount of aëration to remove the more readily putrescible matters from the sewage, and thereby to a certain extent increase its stability.

"Black and Phelps were so far convinced of the practicability of such methods of treatment of sewage as to recommend that the sewage from a certain section of the New York area should be dealt with on these lines prior to discharge into the waters of the harbour. In the annual report of the Massachusetts State Board of Health for the year 1912 published at the end of 1913, is described an investigation by Clark and De M. Gage on the possibilities of the use of aëration for preliminary treatment of sewage, prior to filtration. They found that simple aëration of sewage for twenty-four hours reduced the free and albuminoid ammonia to some extent, and that with sewage that was both aërated and seeded with green growths—*Protococcus* and *Scenedesmus*—the albuminoid ammonia was even more noticeably reduced. Later it was found that appreciable nitrification was obtained within twenty-four hours in the aërated sewage containing the green growths. Subsequently, Clark and Gage found that aëration for a much shorter period, in a tank containing slabs of slate about 1 in. apart, covered with a compact brown growth of sewage matters, was sufficient to coagulate the sewage colloids, and thus to produce a well clarified, non-nitrified effluent capable of satisfactory filtration at several times the normal rate.

"Later, Fowler and Mumford§ carried out experiments on the action in the presence of air of an organism designated 'M7' (isolated by Mumford from ponds receiving water discharged from a colliery), on sewage containing a certain proportion of iron salts. This organism has the property of precipitating the iron as ferric hydroxide from solutions of iron salts.

"In the paper referred to it is stated that sewage (in the presence of a certain quantity of iron salts) inoculated with this organism can be thoroughly clarified by six hours' aëration. The resultant effluent after settlement of the separated organic colloids was quite clear, and practically free from colloids. It is further stated that, although the ordinary methods of analysts failed to reveal the extent of the change effected by the above treatment, the effluent after aëration was always non-putrefactive on incubation, and could be readily oxidised and nitrified by filtration at a high rate.

"In quite a recent publication, Clark and Adams¶ give the results obtained during twelve

* Paper read at the annual general meeting of the Association of Managers of Sewage Disposal Works.

† "Experiments on the Oxidation of Sewage Without the Aid of Filters," by Edward Ardern and W. T. Lockett. Journal Society Chemical Industry, vol. xxxiii., No. 10, pp. 523-539.

‡ Report to the Royal Commission on the Metropolitan Sewage Disposal, 1884, vol. ii.

§ Clark and Adams. *Engineering Record*, February 7, 1914, p. 158.

¶ Rafter and Baker, 1894. Sewage Disposal in the United States, p. 535.

‖ Kaye Parry. "Transactions," Institution of Civil Engineers, Ireland, vol. xx., 1888.

* Mason and Hine. Journal American Chemical Society, vol. xiv., p. 7.

† Annual Report, 1897. Rivers Department, Manchester Corporation.

‡ Black and Phelps. Massachusetts Institute of Technology. Contributions from the Sanitary Research Laboratory, vol. vii., Boston, Massachusetts, 1911.

§ Fowler and Mumford. Journal of the Royal Sanitary Institute, November, 1913.

¶ *Engineering Record*, February 7, 1914, p. 158.

months' operation of the specially constructed tank used in their earlier experiments, previously referred to. It is shown that a rather better coagulation of the organic colloids and purification of the sewage generally can be obtained by periods of aeration for a period of five hours under the conditions of experiment than is obtained by ordinary chemical precipitation, and at a considerably reduced cost. The effluent resulting from the aeration treatment has applied to tankfuls 4 feet to 11 feet deep, at rates varying from 5,000,000 to 10,000,000 gallons per day per acre, the production of a well nitrified and thoroughly stable effluent.

In connection with the experiments carried out by Clark, Gage and Adams, it should be mentioned that the sewage treated was considerably more dilute than the majority of English sewages, as will be seen from the following average analytical results given in the paper quoted:

	Parts per 100,000.
Oxygen consumed	3·52
Free and saline ammonia	3·62
Albuminoid ammonia	0·57

The experiments of Clark, Gage and Adams, and of Fowler and Mumford, show a marked advance on previous work; but it will be seen that in the case of the former investigators the idea of surface contact is retained, as evidenced by the construction of the aeration tank, and that in order to produce a nitrified and stable effluent further treatment in filters is still required.

With regard to the method of treatment suggested by Fowler and Mumford, while the clarification is effected in the absence of surface contacts, the questions of inoculation and the addition of iron salts are abandoned, and the provision of filters for the rapid treatment of the clarified effluent remains.

"In a previous communication to this section of the society* in regard to the effect of the waste liquor from sulphate of ammonia plants on the oxidation of sewage, the present authors, in conjunction with Dr. Fowler, gave some results of the direct aëration of sewage. It was noted that while some coagulation of the colloid matter took place in the course of twenty-four hours' aëration, a period of several weeks elapsed before nitrification was complete. In November, 1912, Dr. Fowler visited the States in connection with the question of the pollution of the New York Harbour. Shortly after his return he described to the authors a [illegible] experiment which he had seen in progress at the Lawrence Experiment Station, Massachusetts, which evidently referred to the earlier work of Clark and his colleagues on the aëration of sewage in the presence of green organisms, as the bottle in which the sewage was aërated was coated inside with strands of algal growth. Dr. Fowler suggested that new work might with advantage be carried out on somewhat similar lines."

Following the above introduction, the paper contained a detailed account of a long series of experiments undertaken by the authors in regard to the question of the application of aëration methods in the purification of sewage.

It was found, for instance, that five weeks' continuous aëration was required in order completely to nitrify an average sample of Manchester sewage. If, however, the resultant solid matter was allowed to deposit, and the purified sewage removed by decantation and replaced by a further sample of crude sewage, complete nitrification of this second dose of sewage effected within a reduced period of aeration. It was shown that accumulated deposit resulting from the continuous aëration by prolonged aëration of successive quantities of sewage, which were termed "activated" sludge, had the property of enormously increasing the purification effected by the simple aëration of sewage.

The research, which was confined to laboratory experiments, included an investigation of the conditions controlling the oxidising effect of the "activated" sludge. It was established that, with suitable conditions, an entirely satisfactory effluent could be obtained when Manchester sewage, in intimate contact with one-fourth of its volume of "activated" sludge, was aërated (through plain pipes) for a period of six hours. Under the conditions of experiment, however, it was necessary to subject the "activated" sludge to a further intermediate period of aëration in order to maintain its highest activity.

It is convenient to say at this point that there is believed to be no difference in principle between the reactions involved in this aëration process and in the best type of percolating filters. In the one case "activated" sludge is circulated in intimate contact with a body of sewage saturated with air, while in the other a thin film of sewage passes over an inert material coated with a more or less active sludge. In the aëration process the action is intensified by a more intimate mixture and a greater proportion of sludge in a much more perfectly oxidised state.

While there obviously remains a great deal to learn in regard to the mechanism of the change taking place, it may be stated, generally, that there is an initial flocculation of the dissolved sewage organic matters accompanied by an intensive fermentation of the carbonaceous matters, followed by a rapid nitrification of the ammonia.

The more recent Manchester experiments are described in a paper* presented to the Society of Chemical Industry on November 6th last. In this paper is given a description of larger-scale outdoor experiments on somewhat similar lines to the previous laboratory experiments.

It is satisfactory to note that the results obtained not only equalled, but easily surpassed those previously obtained in the laboratory. Effluents of much higher purity were obtained with a reduced period of aëration, and more important still the necessity of intermediate aeration or reactivation of the sludge was obviated, thus largely doing away with the need for sludge manipulation.

This advance was due mainly to the more effective distribution and consequent more intimate contact of the air with the mixture of sewage and sludge, effected by using air diffused through porous tiles as a means of aëration instead of blowing the air through plain pipes.

For the purpose of these outdoor experiments wooden casks of 50-gallons capacity were employed, and the aëration of the mixture of "activated" sludge and sewage was effected through a porous tile placed on the bottom of the cask. In general a proportion of 1 volume of "activated" sludge to 4 volumes of crude sewage was employed, and on the average the volume of the air used for aeration purposes did not exceed 15 cub. ft. per square foot tank area per hour.

In the following table are given the average results over a period of several weeks, by submitting Manchester sewage to a period of from four to six hours' aëration (in contact with 25 per cent activated sludge). At the end of the aëration period, one to two hours' settlement was allowed, and the purified effluent decanted off prior to the next charge of crude sewage.

Oxidation of Manchester Sewage.

Results in parts per 100,000.

	6 hours' aeration.			4 hours' aeration.		
	Raw sewage.	Effluent.	Purification.	Raw sewage.	Effluent.	Purification.
4 hours' oxygen absorption.	10·22	0·80	92%	10·23	1·03	90%
Free and saline ammonia	3·86	0·32	—	3·46	0·21	—
Albuminoid ammonia	1·03	0·08	92%	0·99	0·10	90%
Nitrite as NH	—	0·06	—	—	0·07	—
Nitrate as NH	—	1·87	—	—	1·60	—
Absorption of dissolved oxygen 5 days at 65° Fahr.	—	0·80	—	—	—	—
Temperature	16° to 22° C.			15° to 20° C.		
Quantity of sewage dealt with in 12 casks	4 fillings each at 10 gals. 240 gals. per day.			4 fillings each at 10 gals. 320 gals. per day.		

The effluents obtained throughout this series of experiments were extremely well clarified, and in general were superior to those yielded by the best type of bacterial filters.

Special attention may be drawn to the very low free ammonia content of the resultant effluents, and also to the small amount of dissolved oxygen absorbed by the shaken effluent in five days at 65 deg. Fahr. It will be remembered that the standard proposed by the Royal Commission on

* Fowler, Ardern and Lockett. Journal Society Chemical Industry, vol. xxxi., No. 10, 1912.

* Ardern and Lockett. Journal Society Chemical Industry, vol. xxxiii., No. 23, 1914.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] ful, it was at once decided to take advantage of [illegible] works in the shape of roughing filters, the floors of [illegible]

The following results of the aëration of Salford [illegible] Mr. Melling:

[illegible]
Results in parts per 100,000.

—	[illegible]	[illegible] hours' aëration.	Purification calculated on settled sewage.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	—
[illegible]	—	[illegible]	—

[illegible]

[illegible] ordinarily low free ammonia content and the small [illegible] agreement with the effluents obtained from Manchester sewage with a larger period of aëration.

From the first it has been acknowledged that a [illegible] Salford experiments, and consequently it cannot be assumed that such results as those quoted above would be maintained when the air supply is reduced to a practicable amount. It is interesting to note also that experiments carried out by Messrs. Wakefield and Ward have shown that such a refrac[illegible] satisfactorily purified on similar lines to those already [illegible]

It will now be convenient to say a few words in regard to the character and composition of the [illegible]

It differs entirely from the sludge resulting from the usual tank treatment of sewage, in that it is quite inoffensive and flocculent in character, and, despite its low specific gravity, readily separates from water or sewage. After prolonged settlement, however, the activated sludge rarely contains less than 95 per cent of water. A remarkable further separation of the water from the sludge can be readily obtained by treatment on fine-grade filters with the production of a sludge of the consistency of a stiff jelly.

In the following table are given the results of analysis of—(1) The Manchester "activated" sludge, and (2) the Salford "activated" sludge, taken from [illegible] S. E. Melling, already referred to:—

	Activated Sludge (dry). Manchester	Salford
	Percentage.	
Organic matter	64·7	54·5
Mineral matter	35·3	45·5
Total nitrogen	4·6	3·75
Total [illegible] the organic matter	7·1	6·9
Phosphate P_2O_5	2·7	2·1
Extractive matter (grease, colouring matter, &c.)	9·5	4·8

The outstanding feature of the above analysis is the abnormally high percentage of nitrogen as compared with that present in the usual unoxidised tank sludge. This increase in nitrogen is in all probability [illegible] in the sewage. It is understood that the "activated"

[illegible] S. E. Melling. Journal Society Chemical Industry. [illegible] No. [illegible] 1914.

[illegible] Wakefield's experiments having [illegible] 4 and [illegible] per cent. nitrogen.

Returning to a general consideration of the conditions controlling the oxidation process, the Manchester [illegible] 1914 [illegible] may be summarised:

(1) That, for complete nitrification with a reasonable aëration period, a considerable portion of activated sludge should be employed—probably not less than [illegible] of sludge to 4 volumes of sewage. Well clarified effluents, showing a high percentage purification, may, however, be obtained with a much less proportion of sludge.

(2) That it is essential there should be intimate [illegible] of the [illegible] sludge and sewage. It is therefore highly important that adequate means should be adopted for the removal of road detritus, grit, &c., from the sewage; otherwise there will be a tendency to form deposits on the floor of the aëration tank. Under such condition not only is a proportion of the active sludge removed from the sphere of action, but the accumulated banks of sludge are liable to give rise to certain secondary reactions inimical to the complete success of the oxidation process.

(3) That temperature is an important factor in the success of the aëration process. The purification is seriously diminished at temperatures constantly below 10 deg. Cent.; above this temperature satisfactory results can be maintained. It is advantageous, however, if a temperature approaching 20 deg. Cent. can be maintained, as under these conditions nitrification is greatly facilitated. In this connection it must be remembered that the Manchester and Salford results [illegible] previously were obtained during the summer and autumn months with entirely favourable temperature conditions. In the majority of cases maintenance of these excellent results during the winter months would [illegible] require that the temperature of the sewage should be raised slightly by the use of warm air or by other means.

(4) It is necessary, in order that nitrification should proceed without hindrance, that the alkalinity or basicity of the sewage and sludge should be sufficient to account for the nitric acid resulting from nitrification of the ammonium salts. When employing a proportion of 1 volume of activated sludge to 4 volumes of sewage no difficulty has, however, arisen in this [illegible] either at Manchester or Salford. The oxidation process is essentially biological, and consequently care will have to be exercised when dealing with a sewage liable to contain excessive quantities of inhibitory trade effluents, especially as complete success [illegible] on the maintenance of the activity of the nitrifying organisms, which, unless thoroughly established, are very susceptible to adverse conditions.

It should be stated that the whole of the results described have been obtained by working aëration tanks on what may be termed the "fill-and-draw" method of working. Experiments carried out on a continuous-flow system have so far not met with the same success on account of certain engineering difficulties which obtained. Satisfactory progress with this method of working is dependent on the design of a tank in which these difficulties may be overcome.

As previously stated, a large amount of further re[illegible] required [illegible] complete understanding of the purification changes. In addition to this need for further scientific research, there are several questions of urgent practical import requiring attention, chief among which may be mentioned:—

(1) The question of accelerating the rate of initial accumulation of activated sludge.

(2) The minimum amount of air essential to the proper working of the oxidation process.

Both these questions are at present receiving serious consideration. In regard to the former, the use of slurry or hum is from percolating filters has been found advantageous. Experiments are in progress [illegible] that economy of air may be effected by accumulating partially activated sludge by the aëration of daily doses of sewage with final activation of the sludge thus accumulated, instead of proceeding to complete nitrification with each dose of sewage, as was the case in the earlier experiments.

With regard to the question of air supply, it would appear that the maximum volume need not exceed 15 cub. ft. of free air per square foot of tank area; but this question can only be settled by determinations under actual working conditions, and it is ob[illegible] dependent on the method of aëration employed and on the design of the aëration tank.

Having enumerated the points which may be con-

The Surveyor

And Municipal and County Engineer.

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sidered established, and indicated the questions on which further information is required, some consideration may be given to the practical possibilities of the aeration process as compared with the present-day methods of sewage purification.

The advantages of this new method may be briefly summarised as follows:—

(1) Improved sanitary conditions, by reason of freedom from nuisance either from smell or offensive sludge, and the elimination of the fly trouble connected with certain types of filters.

(2) More perfectly oxidised effluents, saturated with dissolved oxygen and with an abnormally low free ammonia content.

(3) The production of a sludge which can be readily dealt with, and which, by reason of its high nitrogen content, is a valuable fertiliser.

(4) Greater freedom of choice of outfall site on account of the very considerable reduction in area of works required.

(5) Greatly reduced capital cost.

On the other hand the aëration process, being essentially a highly intensified bacterial action, will require closer scientific control than is demanded by the usual filtration areas.

With regard to the question of maintenance costs, it is scarcely possible at present to make a definite statement, especially as they are naturally dependent on the details concerned with the mechanical application of air on the large scale, which remain to be fully developed. On the basis of the volume of air employed in the Manchester experiments, the data available in regard to cost is such as to render it probable that the maintenance charges will not exceed the present cost of chemical treatment without making any allowance for the value of the resultant sludge.

In conclusion, the writer, in common with other investigators who have had the opportunity and privilege of undertaking this pioneer work, is convinced that the future development of the sewage problem lies in the direction of the experimental work herein described.

[A report of the discussion on the foregoing paper will appear next week.]

Road-making Tools for the Continent.—According to a *Times* despatch from Boulogne the extremely bad condition of the main roads has proved one of the greatest obstacles to the rapid advance of the Allies in Belgium and Northern France. Temporary repairs having been found to be of little service, it has been decided to remake the roads, and with this end in view orders have been sent to England for thousands of tons of spades, picks and wheelbarrows.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

What do the advocates of street tramways think, after the fiasco which was witnessed in London a few days ago, when hundreds of tramcars on both sides of the Thames were brought to a standstill owing to a street blockade caused by, and the crowds of passengers were left stranded on the roads? Is it altogether comforting to reflect that, in a rigid system of street railway such a catastrophe may occur at any moment? And is not a remedy for this undesirable state of affairs to be found in the independent and mobile motor 'bus? Will not the London County Council now be obliged to reconsider their position, and withdraw the Bills they have in Parliament this Session for extensions of their tramway systems, instead of sinking more of the ratepayers' money in such out-of-date methods of locomotion?

* * * *

Has anyone in this country had an opportunity yet of seeing the latest American invention, the steam grave-digger? Is it a fact that this mechanical tool can dig about ten graves in the same time that it takes to dig one by manual labour? If so, will not the sexton soon be an official of the past? By the way, is it not rather a travesty that the inventor of this machine should claim, as an additional advantage, that it is an excellent implement for digging trenches in the battle-field?

* * * *

Why is it that at nearly all our English spas, and at many foreign watering-places which have become famous for the special attributes of their waters, the use of the natural waters is becoming less and less, and electric, chemical and other baths are taking their place? If this change continues much further, will it not be just as well to stop in London and indulge in any "fancy" bath one likes without the trouble and expense of going to one of the "celebrated" watering places?

* * * *

What do engineers in private practice think of the circular just issued by the Institution of Civil Engineers, strongly condemning the action of members of the institution who have lately responded to an advertisement of the Eastern Valley (Monmouthshire) Joint Sewerage Board inviting the submission of terms for certain professional engineering services? Is it not to be hoped that only very junior members of the profession responded to this advertisement? Is there not some slight excuse for their doing so, as otherwise how are they to get any work? Surely a brass plate on an office door in Westminster is not the only thing necessary to further one in the profession?

* * * *

When will our learned judges be able to make up their minds as to what is a sewer and what is a drain? Was it not a grievous pity that even this simple problem was further obscured by the introduction of the "combined drain"? Do not the same remarks also apply to the determination of the much-fought question as to whether a gully is part of the sewer or part of the road? Have there not been yards of legal arguments, discussions, and judgments on the above matters with, at present, no very definite conclusions reached?

* * * *

Is not the Army Council to be congratulated on its choice of its additional civilian member? Is not Sir George Gibb just the very man for the post, and will not his experience and judgment be of the greatest help to the council in solving the numerous intricate problems which constantly beset their path? And may we not hope that there will now be a general "speeding up" of some of their actions?

* * * *

Was it not rather remarkable that, while your contributor was penning his question as to whether £120 a year was not a rather paltry minimum salary for a professional man acting as surveyor of a town, the enlightened Llanybyther Rural District Council were deciding that £45 a year was ample salary for *their* surveyor?

Law Notes.

Edited by L. E. LONIE CONDER, 47 Moorgate street, E.C., Solicitor of the Supreme Court

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries which should be written legibly on foolscap paper, on one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address. Correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in* BLACK INK *only, and in such style as to be fit for direct reproduction i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.*

Gas—Authorities Protection Act, 1895—Negligence in Execution of Contract.—An important case under the Public Authorities Protection Act, 1893, has been decided by the Court of Appeal in *Myers v. Corporation of Newcastle* (October 2nd). By a special Act of 1871 the corporation were authorised to make, store and supply gas, and to sell, manufacture and dispose of coke and other matters, the proceeds of the coal and other materials employed in the manufacture of such gas in such a manner as they might think fit. The plaintiff ordered a ton of coke from the corporation, and their men, in the course of delivering the coke, negligently tipped some of it through the plaintiff's shop window instead of down the coal-hole. More than six months afterwards the plaintiff commenced this action in the County Court, claiming damages for negligence. The corporation pleaded the Act, and the County Court Judge decided in their favour. The plaintiff appealed to the Divisional Court, the appeal being heard by Mr. Justice Lush and Mr. Justice Bray, who differed in opinion. Mr. Justice Lush held that, as the corporation, acting within their statutory powers, had undertaken obligations to a particular individual, and in the course of discharging these obligations had been guilty of negligence by their servant, the case was not one in which they were acting directly in the execution of a public duty, and consequently they were not protected by the provisions of the Act. Mr. Justice Bray, on the other hand, held that, in the sale and delivery of the coke, the corporation were executing a public duty, and that being so they were protected by the statute. The Court of Appeal agreed with Mr. Justice Lush, and allowed the plaintiff's appeal. Lord Justice Buckley, in the course of his judgment, said that the contract to supply the plaintiff with coke was a voluntary contract for the breach of which the plaintiff could not have brought an action based on a breach of a statutory duty owed to him as a ratepayer. If, therefore, in the performance of this contract with the plaintiff as an individual, and not as a member of the public, they were negligent, the privilege claimed did not apply, and the plaintiff was not required to commence proceedings within six months. The appeal was dismissed with costs.

Electric Supply. Charges. Undue Preference.—An important point under the Electric Lighting Act, 1882, was decided in *Attorney-General at the Relation of the Long Eaton Gas Company v. Long Eaton Urban District Council* (Court of Appeal, October 29th). By sec. 19 of the Act, where electricity is supplied in any part of an area for private purposes, then (except as otherwise provided by the licence, order, or special Act authorising the supply) every company or person within that part of the area is to be entitled to a supply on the same terms as any other company or person. By sec. 20 the undertakers are not to show any preference to any local authority, company or person. The council were authorised to supply electricity by a special Act, which contained nothing varying the above provisions. Up to January 1, 1912, they made the following charges: For lighting, 3d. per Board of Trade unit per quarter for the first 2,000 units, and 2d. per unit afterwards; for power, 1d. per unit per quarter for a supply exceeding 4,000 and not exceeding 6,000 units, and afterwards ¾d. per unit. On September 25, 1911, the council issued a circular giving notice of their intention to alter these charges by increasing the charge for power to consumers who took power only, or power and partial lighting, the charge for power remaining unaltered for those who took both power and all their light from the council. The case was tried by Mr. Justice Sargant, who held that the council had failed to discharge the onus of proof that this preference was justified under secs. 19 and 20 of the Act of 1882. This decision the Court of Appeal affirmed.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nome de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

Abatement of Nuisances in Urgent Cases.—"Yny" writes: My council have had considerable trouble in connection with the chokage of combined drains, and at its last meeting it was suggested that the surveyor, in case of emergency, could take steps to have the combined drains relieved after written notice without waiting to receive instructions from the council. I shall be much obliged if you will kindly advise as to what power the council has, in addition to the powers conferred by secs. 41 and 94 of the Public Health Act, 1875, to enforce the abatement of nuisances in case of emergency by doing the work themselves or otherwise, and the mode of procedure to be adopted. As far as I can see, sec. 41 of the Public Health Act, 1875, only provides for the examination of drains on written complaint of nuisance, and the service of notice after receiving instructions from the council; but my council suggested that the surveyor has power under the Public Health Acts to have the drain relieved on his own initiative—*i.e.*, without waiting, in case of emergency, for instructions from them. Part III. (only) of the Public Health Amendment Act, 1890, has been adopted. I shall be much obliged if you will favour me with your valuable advice and comments on the case stated.

There do not appear to be any powers for dealing with nuisances in drains, except those contained in secs. 41 and 94 of the Public Health Act, 1875, sec. 19 of the Public Health Act Amendment Act, 1890 (applicable to "single private drains"), and secs. 34 and 35 of the Public Health Acts Amendment Act, 1907 (which are only applicable in districts in which they have been applied). There is nothing in any of these provisions authorising the surveyor either to give notice or to do the necessary work on his own initiative without the express authority of the council. In case of emergency the council can empower the surveyor to enter and examine the drain without notice, but the work cannot be done by the council until notice has been given to the owner or occupier, and he has made default in doing it, except where the person causing the nuisance cannot be found, and it is clear that the nuisance does not arise or continue by the act, default, or sufferance of the owner or occupier. It must be borne in mind, moreover, that it is not every combined drain that is a "single private drain" within the meaning of the Act of 1890. See *Wood Green Urban District Council v. Joseph* (1907, 1 K.B., 182.) A combined drain which is not a "single private drain" is a "sewer" repairable by the local authority.

Surveyor to Urban District Council: Extra Remuneration.—"Watkin" writes: The council are desirous of making a payment to me for the preparation of plans, specifications, and quantities in connection with a housing scheme. Please state the various ways in which such payment may legally be made.

There is no provision authorising the making of an extraordinary payment—*i.e.*, one in addition to salary—to a surveyor to an urban district council. The Local Government Board have suggested in some cases whether the object might not be attained by an increase of salary for a specified period, pointing out that in this case the period must be prospective—*i.e.*, must commence not sooner than the date of the resolution of the council awarding such increase (Lumley's "Public Health Acts," 8th edition, p. 451). In *Regina v. Gloucester Corporation* (23 J.P., 709), however, the Court held that a payment of £100 to the surveyor of a local board, for extra services as an engineer, was legal. If the work has not yet been done, the safer method of carrying out the matter would be by an increase of salary for a specified period. Whichever course is adopted, it would be advisable to apply to the Local Government Board for their approval beforehand.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

[illegible] have been chosen to be awarded [illegible] Mr. W. R. Hewer, [illegible] Theory of Structures and Strength of Materials, by Arthur Morley, published by Longmans & Co., and by Mr. Bernard Keyting, of Hove, Practical Designs of Reinforced Concrete Beams and Columns and Structural Iron and Steel, by W. Noble Twelvetrees, published by Whittaker & Co.

QUESTIONS.

This week answers are invited to the following questions:

445. Cement Testing. Sketch and describe the apparatus necessary for conducting the tensile weight and specific gravity tests for Portland cement.

446. Materials. What is Mexican bitumen? Is it a natural product like Trinidad Lake bitumen, or is it a manufactured article, a trade term for a by-product of petroleum? If the former, what part of Mexico does it come from? (H. F. W., *Tottenham.*)

447. Geodesy. Explain how the length of a measured base may be checked by triangulation. What is meant by a "base of verification"?

448. Hydraulics. Explain and illustrate by reference to a stream of rectangular section, 12 ft. wide and 3 ft. deep, the term "hydraulic mean depth"; and state in what manner and approximately to what extent the mean velocity of the stream would be affected by widening it to 24 ft., assuming the depth and inclination to remain the same. (A.M.I.C.E.)

449. Roof Truss. Sketch a light iron roof truss for a span of 20 ft., and give enlarged details of the joints.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

442. Building Materials. What are encaustic tiles, and how are they made?

The following description of encaustic tiles and their manufacture is taken from Rivington's "Notes on Building Construction," Vol. III., p. 111. Encaustic tiles are those in which the colour is produced by substances mixed in with clay—not printed on after the tile is made. Such tiles may be made from ordinary clays and marls, carefully prepared, sometimes mixed with finer clays, and also with different colouring substances, such as manganese for black, cobalt for blue. Those tiles which are ornamented by inlaid patterns of different colours are made in the following manner: The clay used is first very carefully prepared, mixed with the colouring matter, and "slipped" that is, passed through fine muslin or silk sieves; boiled in the slip-kiln until it becomes plastic, wedged—that is, cut up into pieces—which are dashed against one another to drive out the air and consolidate them; and then [illegible] for several months during which fermentation goes on and organic matters disappear. During this time the wedging should be repeated at intervals. After this the clay is sliced [illegible] up by means of a wire into long pieces—which are kept always in the same direction. This consolidates the mass and preserves the grain. Each tile generally consists of three layers—the face, which is a slab of very pure clay of the colour required for the ground of the pattern; the body, which is of coarser clay; and the back, to prevent warping, which is formed with a thin layer of clay different from the body. The clay for the face is cut into a pat about ¼ in. thick, and as much larger in area as will allow for contraction in burning. It is then placed upon a plaster-of-Paris slab, upon which the form of the inlaid pattern is left in relief. The face clay pressing upon this receives an indentation corresponding to the form of the pattern required. It is then backed up with the body of the coarser clay, and the thin layer to form the back. At this stage the maker's name is stamped on the back, and also a few holes to make the cement adhere to the tile when it is set. Slip clay of the different colours required, according to the design, is then poured into the different parts of the indented pattern on the face. After this has become hard the superfluous clay is carefully scraped off, leaving it only in the parts originally indented so as to form the pattern. The raw clay tiles are then trimmed, carefully dried, baked in ovens, protected from smoke, &c., by being arranged in large fireclay jars, called seggars. The burnt tiles may then, if required, be glazed by dipping them into a mixture of powdered glass and water, and reheating. Inferior Encaustic Tiles.—A class of pseudo-encaustic tiles is now being largely made, in which the colour, which should be burnt in along with the clay, is merely applied as a transfer printed pattern on the surface. Such tiles are frequently coated in the glass oven with a transparent fritted glaze, and serve for flower-boxes, wall tiles, and such like purposes. To give them the appearance of having true inlaid colours, the edges of these tiles have frequently a little colour applied to them to represent the depth of the insertion of the coloured clay. (Stato.)

443. Vectors. What are vector quantities? Explain how they may be added together graphically.

Certain quantities, such as the weight of a body, a sum of money, the energy of a body, can be denoted by mere numbers which represent their magnitudes in suitable units. For example, a body may weigh 5 lb., a sum of money may be £100, and such quantities are called *scalars*. In contradistinction to such quantities there are certain magnitudes which involve the idea of direction as well, and cannot, therefore, be completely defined by numbers. At the same time the direction must also be stated, for if the magnitude only is given the quantity is not completely specified. All such quantities are called *vector quantities*. Examples of these are found in the conception of velocity or force. A *vector quantity* may be represented by a straight line, which is called a *vector*. The length of the vector represents to a suitable scale the magnitude of the quantity, and the direction of the line its direction. Thus, a line AB (Fig. 1) represents a vector quantity whose magnitude is the length AB, to a certain

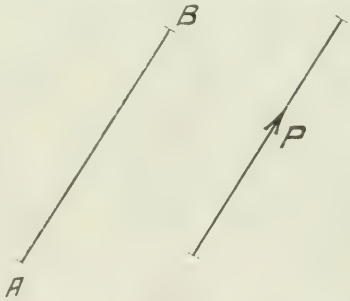


FIG. 1.

[illegible] AB. [illegible] AB [illegible] BA. This distinction is the *sense* of the direction, [illegible] by placing an arrow-head on the vector. Another way of showing a vector is shown in Fig. 1, in which [illegible] P. Q. R [illegible] S. [illegible] AB [illegible] Q, [illegible] CD [illegible] R, [illegible] DE [illegible]

Fig. 2.

[illegible] EA. Then the vector AE, which is equal to T, [illegible] of the vectors P, Q, R, and S. It should be noted that it is quite immaterial in what order we take the vectors in performing the addition. The vector T is also called the *resultant vector*, and the polygon ABCDEA is called a *vector polygon*. In adding together two vectors, the resultant vector forms the closing side of a triangle, or the diagonal of a parallelogram, as with the triangle of forces and parallelogram of forces. (T. W. P., [illegible])

Note.—Replies to Question 444 will be published in our next issue.—Ed.

PRO PATRIA.

[FIFTEENTH LIST.]

We present herewith the fifteenth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Forbes, A., county road surveyor, Dunfermline District, Fife County Council, 10th Battalion, Royal Scots.

Marlow, G. E., surveyor to the Desborough Urban District Council, Northants Yeomanry (Territorials).

Morgan, Archibald Percy, shorthand clerk, borough surveyor's department, Gillingham, corporal, Royal Engineers Motor-cycle Corps, drafted to the 17th Signal Company.

Negus, F. H., sanitary surveyor to the Meriden Rural District Council, has volunteered for active service.

Two deputy inspectors of the Thames Conservancy, Messrs. T. Hawes and C. T. C. Barker, have had their offers to serve the Crown as navigation officers accepted, and have each been given a commission. The board on Monday agreed to allow them full pay while employed by the Admiralty, on the ground that such commissions involved exceptional expenses. The board's decision as to employees generally was, it may be recalled, to pay full wages less the Government allowances.

Wearmouth Bridge.—The Sunderland Corporation on Wednesday agreed to promote a Bill in the present Session of Parliament authorising the reconstruction of Wearmouth Bridge.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Andover T.C. (December 2nd. Mr. F. O. Stanford). [illegible] in respect of excess expenditure [illegible] and sale of [illegible] The inspector pointed out that in the application for loans the Local Government Board allowed 7½ of the expenditure to be paid [illegible] which was a rather large amount. Then they were asking for [illegible] had been paid from current account, or else deduct them from the present application. They had not been paid, and so it left nothing for them to borrow. The town clerk said they could not pay it out of revenue, and if the Local Government Board could not help them he did not know how the contractors would get their money. Mr. M. Taylor (engineer) informed the inspector that the corporation had been hit in a very hard way. They were thrust into a law action, and the Local Government Board were very severe upon the corporation in the terms under which they sanctioned the loan for the last work, which placed the corporation in a very difficult position. All that expenditure had been incurred in order to satisfy riparian owners who were bringing actions against the council, and the work had to be done. The borough surveyor, Mr. R. W. Knapp, stated, with respect to the second application, that it was proposed to take out the old ruined 9-in. surface-water drain and substitute pipes of 15 in. and 18 in.

Cardiff T.C. (December 15th. Mr. Edgar Dudley).—This was an inquiry into the application of the corporation for a Provisional Order giving compulsory powers to acquire the necessary land and property for the widening of Duke-street, through which it is proposed to lay a tram track.—The city engineer, Mr. W. Harpur, said he estimated the total cost of the property at £130,419, and the cost of the works at £2,500. The value of the surplus land which the council would acquire he estimated at £47,250. This, it was explained, would reduce the cost to under £100,000—viz., about £85,750. Mr. Harpur presented a census of the traffic in Duke-street during the last week, showing the congestion in that thoroughfare. It was the narrowest link in the long chain of roads stretching from London to Milford.

Chorley T.C. (December 2nd. Mr. Edgar Dudley).—£3,250 for the purchase of property for the construction of a new street from Devonshire-road to St. Thomas-street. It was explained that the proposed loan was required for the purchase of trust property for the purpose of the improvement.

Chorleywood U.D.C. (December 3rd. Mr. F. O. Stanford).—£3,875 for road making, and £200 for the purchase of land for the purpose of a soakaway.—The surveyor, Mr. W. H. Scott, stated that the length of roads it was proposed to make up was—Lower-road, 1,500 ft.; South-road, 1,146 ft.; Station-road, 960 ft.; in all, 3,306 ft.

Hartismere R.D.C. (December 15th. Mr. A. W. Brightmore).—£128 for sinking a well at Palgrave.—In the course of the proceedings the inspector stated that expenditure upon such matters was generally brought before the notice of the board before it was incurred, to which the clerk, Mr. Harold Warnes, replied that after the work was commenced the council found they could borrow for that purpose, and had done so in respect of other parishes. Giving details of the expenditure, Mr. Warnes stated the work was carried out by Mr. Smith, of Fingringhoe, the boring costing £103, the pump and fixing £22, while other expenses brought up the total to £127. The site, it was stated, belonged to the council.

Leek U.D.C. (December 9th. Mr. M. K. North).—£3,660 for laying out of Brough Park.—The engineer, Mr. W. E. Beacham, said it was proposed to lay out Brough Park, an open space of 10a. 1r. 17½p., recently presented to the town by Mr. N. S. Brough. The estimate included the following works: Boundary fences, £793; laying out walks, &c., £862; laying down bowling green, £308; shelter pavilion, with conveniences, £440; greenhouse, £20; bandstand and area surrounding, £417; swings, £50; small shelter, £50; seats, £40; shrubs and planting, £200; and the

[illegible] working upon [illegible] drainage of [illegible] £48. [illegible] was given in support of the [illegible] and [illegible] were [illegible] by the [illegible] of [illegible] by the surveyor. Support was given to the scheme [illegible] to the Authority of the Marquis and [illegible] Committee. The engineer and surveyor and the [illegible] at the cost of the majority stated by the [illegible] proposed works.

East and West Molesey U.D.C. (December 4th. Mr. F. O. Stoddart).—£[illegible] for works of [illegible] sewers. The surveyor, Mr. J. Stevenson, outlined the proposed works.

East Riding C.C. (December 15th. Mr. A. S. [illegible]).—£[illegible] for the purchase of Rowell House [illegible] for a [illegible] sanatorium. The deputy clerk and solicitor to the council, Mr. J. R. Proctor, stated that the city of York would probably combine in the proposal. The site was 225 ft. above the sea level. The purchase price was £5,400. The building would provide accommodation for forty-two beds for the East Riding, and York, which would send one-third of the patients, would bear one-third of the capital cost.

Leigh (Lancs) T.C. (December 15th. Mr. W. O. E. Meade-King).—£1,200 for erecting a park-keeper's cottage, and [illegible] a public bowling green and tennis courts on 2 acres given by Lord Lilford.—His lordship was legally unable to give more than 2 acres, but let 34 acres, mostly woodland, to the corporation at a nominal yearly rental of 10s. The park will be opened next Spring.

Porthcawl U.D.C. (December 2nd. Mr. W. M. Cross).—£8,675 for works of water supply.—Mr. T. G. Jones, J.P. (chairman of the council), and Dr. J. D. Alexander gave evidence in support of the application [illegible] the necessity of an increased supply in consequence of the abnormal advancement of Porthcawl. Mr. Brough Taylor, of Westminster, gave a detailed statement of the scheme.

Wednesbury T.C. (December 9th. Major J. Stewart).—£2,146 for the purposes of the electricity undertaking.—It was stated that the corporation had entered into an arrangement to take a supply of current in bulk from the Midland Electric Corporation for power distribution in order to supply the requirements of the King's Hill district of the borough. Under this arrangement it had become necessary to provide a transformer station and rotary converter. The necessary works had been undertaken, and it was expected a supply would be available before Christmas.

APPLICATIONS FOR LOANS.

Axminster R.D.C.—£1,515 for a new reservoir.

Barrow-in-Furness T.C.—£43,000 for electricity plant.

Bulkington U.D.C.—£8,500 for sewage disposal works.

Croydon T.C.—£2,070 for school sanitary works.

Ealing T.C.—£8,000 for electricity mains, £2,600 for service lines, £300 for transformers and £1,500 for [illegible] extension.

Frome U.D.C.—£1,700 for pumping plant at the waterworks.

Glossop T.C.—£485 for paving work.

Hythe T.C.—£1,000 for laying out Corporation Fields.

Kanturk U.D.C.—£2,300 for a waterworks scheme.

Margate T.C.—£3,000 for the provision of a recreation ground.

Penzance T.C.—£358 for the heating of the municipal buildings and offices, and for furnishing and lighting the Mayor's parlour.

Riccall R.D.C.—£780 for sewer extension.

Upper Stour Main Sewerage Board.—£1,500 for works of sewerage.

Wednesbury T.C.—£1,350 for additions to the public baths.

Weston-super-Mare U.D.C.—£550 for the purchase of a steam roller.

LOANS SANCTIONED.

Bolton-on-Dearne U.D.C.—£71,000 for the provision of working-class houses.

Littlehampton U.D.C.—£710 for public conveniences.

Loughborough T.C.—£1,450 for a site for workmen's houses.

Rugby U.D.C.—£470 for the purchase of land for the purposes of sewage disposal.

Southampton T.C.—£16,000 for school reconstruction and £300 for the purchase of property for road improvement.

Stratford-on-Avon T.C.—£6,900 for a housing scheme.

West Kent Main Sewerage Board.—£7,500 for extensions to the outfall works.

Woking U.D.C.—£2,081 for road improvement works.

Woodford U.D.C.—£[illegible] for wood paving.

Worcestershire C.C.—£[illegible] for a new school at Malvern.

FORTHCOMING INQUIRIES.

DECEMBER.	£
21.—**Epsom.** For the provision of working-class houses (Mr. H. S. Stewart)	3,500
21.—**Grays.** For the provision of public conveniences (Mr. M. K. North)	896
21.—**York.** For the provision of working-class houses (Mr. W. H. Collin)	6,240
22.—**Beckenham.** For road works and culverting (Mr. M. K. North)	3,725
22.—**Ogmore.** For the provision of dwellings (Mr. Edgar Dudley)	5,000
22.—**Tonbridge.** For the erection of working-class houses (Mr. H. S. Stewart) ...	400

SANITATION IN THE TROPICS.

CHADWICK PUBLIC LECTURE.

Government and Civil and Military Sanitation in the Tropics was the subject of a Chadwick Public Lecture delivered by Sir Ronald Ross, K.C.B., F.R.S., at the London School of Economics on Friday last. Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., occupied the chair.

Sir Ronald enumerated four principal questions regarding the attitude of Governments towards sanitation, and sought to give an answer to all of these. He first asked how far was it advisable or necessary for Governments to develop sanitation, and pointed out that, as a matter of fact, sanitation simply could not be conducted by private individuals themselves, and must require the co-operated efforts of the authorities. The second question was, What modifications in the ordinary apparatus of free government were demanded for sanitation? And the lecturer urged that it was unwise to bestow complete liberty of action as regards sanitation on very small municipal governments. He maintained that where the death-rate of such municipalities was above the average, they should be called to account by superior governments, as had actually been done in the case of one municipality in the Empire. His view was that very small municipalities, however desirous they might be to advance sanitation, seldom possessed enough men with sufficient knowledge of town management and hygiene to conduct these branches of administration with success. The third question was whether government should develop research? And this, he said, was already answered by the Colonial Office and the India Office in the affirmative. Lastly, he pointed out that the head of every sanitary administration should be placed upon a footing equal to that of the head of every other great department, and should if possible be always given a seat on the local executive council. He complained that sanitation was too often the Cinderella of human interests, and concluded by pointing out that in the earliest days of European civilisation the Greeks had a statue to the Goddess of Health in the very porch of their great temple on the Acropolis.

The next course of lectures—on War and Disease—will be given by Dr. Sandwith, chairman, County of London Branch, Red Cross League, at the Royal Society of Arts, on January 15th, 22nd and 29th, at 5.15 p.m. Sir William Collins and Sir Frederick Treves will preside respectively at the first and second lectures.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works, of which particulars appear below: Buildings—Birmingham, Ealing, Glasgow, Lanarkshire, Nottingham; housing and town planning—Newcastle-upon-Tyne; refuse disposal—Bilston; roads and materials—Lewisham, St. Columb, Teddington, Tilbury; sewerage and sewage disposal—Chipping Norton, Rugby; water, gas and electricity—Greenock, Warrington. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Birmingham T.C.—The Sites and Buildings Sub-committee recommend the Birmingham Education Committee to approve of plans for submission to the city council for the erection of a new council school at Hall Green. The total cost of the school is estimated at £15,000, plus £900 for furniture and fitting. The accommodation will be for 1,000 children.

Blackburn T.C.—Plans have been submitted to the council for a sanatorium with space for sixty beds.

Bridgnorth T.C.—The council have approved the plans of the borough surveyor, Mr. E. Trevor, for alterations to the council chamber.

Cheltenham T.C.—It has been resolved to build a smallpox hospital at an estimated cost of £1,000.

Dundee T.C.—Ashludie House is to be converted into a sanatorium at an estimated cost of £2,525.

Ealing T.C.—The borough surveyor, Mr. W. R. Hicks, has been instructed to prepare modified plans for a public library at a cost not exceeding £3,000.

Eccles T.C.—A decision has been reached to build a new fire station.

Failsworth U.D.C.—The council have adopted plans for the proposed public baths.

Glasgow T.C.—The city council have received a report from the Improvements Committee on the competitive plans sent in for the buildings to be erected at the corner of Trongate and High-street in connection with the reconstruction of Glasgow Cross. The examiners placed first and selected for the first premium of £50 or for execution the design numbered 18, second the design numbered 14, and third that numbered 12, and recommended that the premiums of £30 and £20 respectively be paid to the authors of the two last mentioned. The plan of No. 18, they stated, was so arranged as to work in satisfactorily with the buildings already erected on each side. The scheme adopted for the retention of the cross steeple and its support in the isolated position it would occupy was both sound structurally and of excellent effect architecturally, while the proposed cross is also successfully treated in the traditional manner. The cost of the scheme is estimated at £28,512, including £2,500 for the cross and steeple. On the sealed envelopes being opened, the awards were announced as follows: (1) No. 18, Honeyman & Keppie, 257 West George-street; (2) No. 14, John M'Kissack & Son, 68 West Regent-street, Glasgow, and William Friskin, Kensington Park-road, London; and (3) No. 12, Alexander D. Hislop, 124 St. Vincent-street, Glasgow. The council agreed to the recommendation of the committee that the author of the design placed first be employed as architect of the buildings.

Lanarkshire C.C.—It has been decided to erect a new police and fire station at Bishopriggs, at an estimated cost of £7,100.

Leeds T.C.—A garage for trackless cars is to be erected in the vicinity of Worral-street.

Northampton T.C.—Plans have been prepared and are under consideration for the extension of the hospital at Harborough-road, at an estimated cost of £2,270.

Nottingham T.C.—Plans for a new school at Forest Fields have been approved. The estimated cost is £6,800.

Oldham T.C.—The general manager of the tram ways has received instructions to report on the advisability of erecting shelters at Rhode Bank and Grains Bar.

Rothwell U.D.C.—The surveyor, Mr. A. Harris, has received instructions to prepare plans for the extension of the municipal offices.

Sheffield T.C.—A scheme has been approved for the extension of the Grossopenond public baths at an estimated cost of £2,600.

Stames R.D.C.—Plans have been approved for a smallpox hospital in High Tree-lane.

Tyrone C.C.—A scheme has been approved for the erection of a sanatorium for twenty-eight beds, and for the building of a residence for the tuberculosis officer, at an estimated cost of £1,350.

Widnes T.C.—The Health Committee recommend the council to apply for a loan of £2,250 for a tuberculosis pavilion.

HOUSING AND TOWN PLANNING.

Ayr T.C.—The Housing Committee have received instructions to report on suitable sites for working-class houses, and the burgh surveyor is to prepare plans and estimates of houses of room and kitchen with scullery and single apartment with scullery.

Birkenhead T.C.—A scheme for the provision of workmen's houses is to be carried out on the Gilbrook estate.

Carlisle T.C.—The borough surveyor, Mr. H. C. Marks, has received instructions to prepare plans for the erection of twelve working-class houses in different parts of the town.

Clydebank T.C.—For the purpose of a housing scheme the Streets and Buildings Committee recommend the purchase by the council of 12 acres of ground on the east side of Kilbowie-road, at the cost of £400 per acre, free of all burdens, including tenants' claims. It was also decided to delay further consideration of the offer of ground on the west side of the road.

Falmouth T.C.—The council have approved the plans of the borough surveyor, Mr. J. S. Walton, for erecting workmen's dwellings on a portion of the Penwerris site.

Kirkintilloch T.C.—The plans of one and two roomed houses which had been prepared have been referred back to the burgh surveyor with an instruction to produce a cheaper scheme for single tenement apartment houses. The Gas Committee reported on a proposal to build workmen's houses at the gasworks. It had been found that a room and kitchen house with bath-room and scullery could not be let for less than £21, and the two-room and kitchen houses at less than £25, assuming a rate of interest of 4 per cent and repayment spread over sixty years. In the circumstances the committee did not see their way to make any recommendation in the matter.

Lichfield T.C.—A scheme has been adopted for the erection of twenty workmen's dwellings on a site on Beacon Hill. It is proposed to build the houses in four blocks, two blocks containing six cottages each, the other blocks to contain four cottages each. There will be ornamental forecourts and large gardens at the rear, and the cottages are to be let at 5s. a week. The total cost is estimated at £4,100, including the construction of a new street along the frontage.

Newcastle-upon-Tyne T.C.—The Housing Committee recommend the council to utilise a piece of land at Walker, containing an area of 25½ acres, in order to erect 600 houses, with gardens attached, of six types of dwellings.

Norwich T.C.—Tenders are to be obtained for the erection of houses for the working-classes at Starling-road. The city engineer, Mr. A. E. Collins, stated that the plans comprised sixteen self-contained houses and eight flats. The council agreed to the scheme in order to give the greatest possible amount of accommodation to families at the lowest possible cost.

Poplar B.C.—The Public Health Committee report that the Local Government Board have decided to accept the scheme of the London County Council for rehousing persons to be displaced by school exten-

[illegible] schemes in Poplar, on the sites, in possession of the council, at Tunnel-avenue, East Greenwich.

Warmley R.D.C.—It has been agreed to purchase 6½ acres of land for £700 for the Bitton housing scheme, and the sanitary surveyor, Mr. H. M. Beg[illegible] has been instructed to submit plans for eight houses.

PARKS AND OPEN SPACES.

Goole T.C.—A scheme has been approved for laying out the Hockerend recreation ground.

Plymouth T.C.—The Hoe and Parks Committee have been instructed to consider the question of a public park or recreation ground near the area Pennycross Ward.

REFUSE COLLECTION AND DISPOSAL.

Bilston U.D.C.—The surveyor, Mr. Vincent Turner, has been instructed to prepare plans and estimates of a destructor suitable for the requirements of the district.

ROADS AND MATERIALS.

Bilston U.D.C.—The council made an application to the Local Government Board for sanction to borrow the sum of £13,773 towards the cost of the Holyhead-road improvement. The total estimated cost of the scheme is £20,101, and towards this amount the Road Board have promised a grant of £5,250, and the Staffs County Council £250.

Cheriton U.D.C.—Private street works are to be carried out in Kent-road at a cost of £450.

Chester R.D.C.—The council have convened a conference with neighbouring authorities and the county surveyor on the subject of constructing a new road from Ellesmere Port to Helsby, by way of Thornton-le-Moors.

Ely R.D.C.—Progress is being made with the negotiations for the construction of a new road from Stretham to Dimock's Cote. The authorities concerned are the Cambs and Isle of Ely County Councils, the South Level Commissioners, and the Road Board. The scheme includes the proposed construction of a bridge over the river.

Haddington C.C.—The Western District Committee have agreed to purchase a boiler for the tar-mixing machine at a cost of £84.

Heysham U.D.C.—A scheme has been approved for the widening of Heysham-road.

Honiton T.C.—The borough surveyor, Mr. A. Tillotson, reported recently that the tar-spraying of the roads during the season had been completed with a considerable saving as compared with previous years. The reduction was undoubtedly brought about by the employment of the council's own workmen and apparatus.

Lewisham B.C.—The council have agreed to an improvement scheme in Sandhurst-road, including laying down tar-macadam, at an estimated cost of £1,267.

Newton R.D.C.—It has been agreed as an experiment to contract only for the supply of stone for six sections of the district roads, and employ a man in each section, at 22s. per week, to spread stone and clear drains. It was stated that more damage was being done now by water running over the roads than was done by traffic.

Penzance T.C.—It has been decided to apply to the Local Government Board for an Order declaring sec. 17 of the Public Health Acts Amendment Act, 1907, to be in force in the district of the urban district council, and that the Highways Committee consider and negotiate for a new road round Lescudjack Hill.

Ripon R.D.C.—The surveyor, Mr. J. W. Plewes, reports that there is a prospect of obtaining a grant from the Road Board in aid of the Markington-road and Fountain-road improvement, the estimated cost of which is £623.

St. Columb R.D.C.—A sub-committee is engaged in preparing a scheme for a new road 2¼ miles in length from Wadebridge to Ruthern Bridge.

Stirlingshire C.C.—It has been agreed to carry out a road improvement scheme at an estimated cost of £2,420.

Teddington U.D.C.—Mr. M. Hainsworth, the surveyor, has been asked to prepare an estimate of the cost of substituting creosoted deal for asphalt for the margins of Kingston-road. The cost will be borne as to one-third by the Road Board, and two-thirds by the Middlesex County Council.

Tilbury U.D.C.—The surveyor's staff are engaged on the improvement of roads leading from Tilbury Fort, for military purposes. This work comprises the strengthening of existing foundations, widening, and metalling the surface. The cost will be approximately £4,000. The entire cost of the South Ward section and 75 per cent of the cost of the North Ward section is to be borne by the Road Board on behalf of the War Department. Mr. H. P. Maveaury, M.INST.C.E., manager and engineer to the Road Board, has written the council's engineer asking that the works be completed as expeditiously as possible.

Towyn U.D.C.—The Road Board have notified their willingness to give grants of 75 per cent of the cost of road improvement schemes, estimated at £731, to provide work for relief of unemployment arising out of the war in Towyn and Aberdovey district. The urban council have made arrangements to submit a list of the men unemployed, and the schemes are ready to be carried out.

Youghal U.D.C.—A scheme is to be carried out for widening the main road from Cork to Waterford at an estimated cost of £3,000.

SEWERAGE AND SEWAGE DISPOSAL.

Belper R.D.C.—The surveyor, Mr. R. C. Gordon, reports that the estimated cost of the drainage scheme for the Smithy Houses portion of Denby was £236. With respect to Horsley Woodhouse, it was considered locally that nothing short of a comprehensive scheme of sewerage and sewage disposal would modify the present unsatisfactory condition of affairs.

Birstall U.D.C.—It has been agreed to carry out sewer extensions at a cost of £420.

Bolsover U.D.C.—The council have confirmed the recommendation of the Sanitary Committee for the adoption of the water-carriage system on sixty-five properties.

Chipping Norton T.C.—The contract has now been signed between the corporation and Messrs. Rowell & Sons, contractors, Chipping Norton, for carrying out the extensions to the sewerage and sewage disposal works in accordance with the scheme prepared by Messrs. Berrington, Son & Watney. Messrs. Rowell & Sons' tender for the work is £9,088.

Doncaster R.D.C.—The council have succeeded in obtaining a site for the sewage outfall works at Barmbrough.

Emley (Yorks) U.D.C.—The surveyor, Mr. S. Gill, has been instructed to prepare a scheme for improvements at the sewage beds.

Flaxton R.D.C.—It has been resolved to carry out a sewerage scheme at Heworth Without, at an estimated cost of £648.

Newquay U.D.C.—Subject to sanction of the Local Government Board, the tender of Mr. Horace Clemens has been accepted for the construction of a tunnel sewer in Central-square and Fore-street, at £543, and the construction of 15-in. and 12-in. sewers in Crantock-street, for £356; Messrs. Murrin & Pengelley for a 12-in. sewer in Tower-road, at £254; a 12-in. sewer in Bank-street and Beachfield-avenue, at £261; a 12-in. sewer in Station-road, and Tolcarne-road, and Edgcumbe-avenue, at £635.

Rugby R.D.C.—The sewerage scheme for New Bilton, which the council have resolved to carry out, will, it is estimated, cost £3,200.

South Westmorland R.D.C.—A scheme of sewerage for Haversham is receiving the consideration of a special committee.

Wokingham R.D.C.—Consideration is being given to a drainage scheme for Crowthorne.

WATER, GAS, AND ELECTRICITY.

Axminster R.D.C.—The plans for the building of a new reservoir at Axminster have been forwarded to the Local Government Board for their approval, with a request for sanction to borrow £1,515.

Barrow-in-Furness T.C.—It has been decided to arrange the town into separate water areas, in each of which a waste-detecting meter will be installed. It has also been agreed to provide additional sluice valves.

Belfast T.C.—A resolution has been passed by the

council a committee calling for a reorganisation of the cleansing department.

Brampton R.D.C.—It is proposed to provide a water supply for Cleatorpark at an estimated cost of £1,[illegible].

Burry Port U.D.C.—It has been agreed to carry out a scheme of sewerage [illegible].

Dumbarton T.C.—The council have agreed to extend the cleansing at an estimated cost of £4,000.

Greenock T.C.—The Electricity Committee propose that application should be made to the Secretary for Scotland for power to borrow £30,000 to enable them to meet the increasing requirements of the department. It is expected that [illegible] of the supplies to local public works and to Port Glasgow.

Holywell U.D.C.—The council have decided that the [illegible] and drainage scheme, for which the Local Government Board have sanctioned a loan of £14,000, shall not be proceeded with until a favourable opportunity arises, which, it is understood, will not be until after the war has been concluded.

Lostwithiel T.C.—It is announced that the gas company have agreed to the principle of paying for gas for public lighting as ascertained by meters. The new contract commencing on January 1st would be for a term of three years.

Teddington U.D.C.—Fifteen tenders received for installing electric light at the sewage disposal works have been referred to the engineers for report.

Torquay T.C.—Subject to loans being obtained, the council have agreed to accept the tender of Mr. H. Duke, of Plymouth, at £1,457, for laying the new water main from Hennock to Knighton Heath, that of Messrs. Fothergill Brothers, Exeter, at £1,712, for laying the new main from Knighton Heath to Sandford Orleigh; and that of the Stanton Iron Company, Nottingham, at £12,821, for the main from Hennock to Sandford Orleigh.

Uttoxeter R.D.C.—It has been resolved to make application to the Duchy of Lancaster to provide an improved water supply for Draycott-in-the-Clay.

Warrington T.C.—Consideration is being given to a scheme for the improvement of the water supply at an estimated cost of £10,000.

MISCELLANEOUS.

Leiston U.D.C.—The council have approved the estimate of the surveyor, Mr. C. F. Brown, at £304, for the fencing of the new cemetery.

Saltburn U.D.C.—The surveyor, Mr. Joseph Draper, has been authorised to make inquiries as to the cost of a second and pump for the brine baths.

Southwold T.C.—Various schemes were recently brought forward with a view to dealing with unemployment by a committee appointed for that purpose. After a prolonged discussion it was decided that the surveyor, Mr. J. S. Hurst, should prepare estimates for the work.

Surbiton U.D.C.—Owing to the many calls made by the war on the pockets of the residents, the men employed in the highway department have decided not to follow their usual practice of soliciting subscriptions for Christmas fare for themselves. Further, a balance of £3 on this fund has been given to the Surbiton War Relief Fund. High praise is due to the men for their generous self-denial.

Teddington U.D.C.—On Monday the tender of Messrs. Merryweather & Sons was accepted for the purchase, for £1,070, of a Merryweather patent "Hatfield" pattern motor fire engine, with a 50-ft. wheeled escape attached and first apparatus, and the surveyor, Mr. M. Hainsworth, was asked to submit an estimate of the cost of altering the fire station for housing the engine, the cost thereof to be included in the application for a loan. There were three other tenders—from Messrs. Dennis Brothers, £995; Hy. Simonis, £968; and Leyland Motors, £1,160.

Westminster B.C.—The council have decided to insert a clause in all annual contracts for supplies and work hereafter entered into that no German or Austrian goods are to be accepted, also that the council's various sealed samples that are of German or Austrian make be replaced by others, preferably of British make.

Yarmouth T.C.—The borough surveyor, Mr. J. W. Cockrill, is considering a scheme for the installation of fire alarms throughout the town.

PERSONAL.

Mr. Thomas K. Fraser, of Silverwells, Bothwell, has been appointed burgh surveyor and master of works to the Airdrie Town Council.

Mr. J. Paton was on Tuesday last appointed borough surveyor of the enlarged borough of Plymouth for four years, at a salary of £800 a year.

Mr. C. W. Kendrick, sanitary surveyor and inspector to the Bingham Rural District Council, has had his salary increased from £150 to £200 a year.

Mr. Raymond Unwin, vice-president of the Town Planning Institute, has been appointed chief town planning inspector under the Local Government Board.

Mr. H. D. Sowerby has been appointed temporary road surveyor to the Dunfermline District Committee, Fife County Council, during the absence of Mr. A. Forbes on active service.

Mr. Stanley G. Critchell, formerly pupil and assistant to Mr. J. L. Redfern, borough surveyor of Gillingham, has been appointed assistant municipal engineer to the Lagos Municipality. He sailed on September 26th, and has taken up the work.

Mr. J. R. Heath, deputy surveyor of Stoke-on-Trent, who, as already announced in The Surveyor, has been appointed borough surveyor of Swansea, has been presented by his old colleagues with a silver tea service, an oak tray, and a pipe.

FOR OTHER ADVERTISEMENTS

See End of Paper.

COUNTY BOROUGH OF ROTHERHAM.
APPOINTMENT OF BOROUGH ENGINEER AND SURVEYOR.

The Corporation of Rotherham invite applications for the position of Borough Engineer and Surveyor and Waterworks Engineer and Manager. Commencing salary £500 per annum. The maximum salary for this appointment is £700 per annum, subject to satisfactory service approved by the Corporation. Assistants, clerks and offices, and all travelling and office expenses will be provided by the Corporation.

Applicants must be Corporate Members of the Institute of Civil Engineers and Members of the Institution of Municipal and County Engineers, and not more than 45 years of age. The gentleman appointed will be required to perform the duties set forth in the list of duties which has now been prepared, and can be obtained upon application to the Town Clerk.

In addition, he will be required to carry out such other duties as the Council may from time to time determine. He will not be allowed to carry on private practice, but must devote the whole of his time to the duties of his office, and reside within the Borough.

Applications, stating age and qualifications, accompanied by copies of three testimonials of recent date, to be delivered to the Town Clerk, Town Hall, Rotherham, endorsed "Borough Engineer," not later than the 7th day of January next.

Canvassing Members of the Council, either directly or indirectly, will be a disqualification.

(By order)

CHARLES L. DES FORGES,
Town Clerk.

Town Hall,
Rotherham.
December 18, 1914. (2,179)

SURVEYING ASSISTANT and Draughtsman. Wanted, temporarily, in an Urban Council Surveyor's Office in Surrey, a Surveying Assistant, well experienced in the preparation of schemes for Main Sewerage and Sewage Disposal, details, quantities and estimates; must be quick and accurate surveyor and leveller, and good draughtsman. Salary £2 2s. per week. Applications to state age, particulars of training and experience, and to be accompanied by copies of recent testimonials.—Box 1,487, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,180)

WANTED—New Portable Boiler (with frame and shafts for horse) to supply steam to Ingersol Rock Drill. Capacity 400 to 500 lb. per hour. Working pressure 100 lb.—County Surveyor, Navan. (2,178)

The Future Control and Maintenance of Rural Roads.*

By E. S. WOODDISSE, M.Inst.M.E., Surveyor to the Swardlint Road Board.

[illegible] Municipal and County Engineers held at Cheltenham [illegible] Mr. Hawkins [illegible] veyor of Berkshire), no apology is needed for reopening a subject of such vital importance to the [illegible] of this association, although it has apparently been finally dealt with [illegible] arrived at satisfactory at least to those gentlemen who dominate its policy, and to the county surveyors.

That some change in the management of our rural roads is necessary is indisputable, both in the interests of uniformity and of equalisation of cost. The disadvantages arising out of the present system are obvious to all, and need not be enumerated here. It may also be admitted that many small districts exist which, by reason of their restricted area and rateable value, are utterly incapable of taking their place in any national system that may be adopted. Such comic-opera districts as are, however, depicted by Mr. Hawkins (where an increased estimate of £300 would call for a 6d. rate) are the exception to the rule, if they exist at all. These are matters which call for adjustment by the county council boundaries committees, and need not seriously interfere with the retention by local authorities of some measure of control over the whole of the roads in large rural districts.

The contention of the author is that it is essential in the interests of efficiency and economy that local authorities should retain some measure of control over the roads in their area, subject, of course, to a certain measure of national supervision, where assisted by national funds, and in some cases even where not so assisted.

To place the whole of the roads in England and Wales, as has been suggested, into the hands of some sixty county councils, whose multifarious duties are already getting beyond their capability of control, and the local knowledge and interest of whose members is in many cases confined to their immediate division, would inevitably result in practically the whole of the control being placed in the hands of the county surveyor, who would become a sort of county potentate, with powers beyond those which ought even to be vested in one who has had the training in humility of a district surveyor. In fact, but for such training, he might run the risk of becoming a victim of that terrible malady *caput extensior*. The result would be to destroy the initiative and ambition of the rank and file of those surveyors who have been imbued with the highest ideals, and whose experience and local knowledge well fit them to continue the work which in the past they have performed under disadvantages to themselves and the authorities they have served.

That some local authorities take a parsimonious attitude in their highway expenditure is admitted, and the reason is not far to seek. As the collecting authority both for themselves and the county councils, they come most in touch with the man who pays the piper, and who blames them not only for their own tune, but that also of the higher authority, over whose lavish expenditure they have no control, and whose ever-growing demands compel them to curtail their own requirements, however necessary.

The setting up of the Road Board has undoubtedly been a step in the right direction, and the handing over to that body of executive powers over the whole of the road authorities in the country, with full control over the grants proposed to be made to them (which in many cases require to be greatly increased), would inevitably result in the adoption of a more uniform system in the management and control of our roads, while retaining that amount of local supervision which is essential in the interests of true economy and efficiency and compatible with the spirit of local government, and is an important factor in centralising and creating a national system.

[illegible] would thus be obviated so far as desirable, while those of multiplicity of control (so detestable to our county surveyors) could be further minimised by the setting up of boards similar to the old highway boards, having control over the whole of the main and other roads in their area, under direction of the Road Board and [illegible] from the county and rural councils jointly. Smaller areas could thus be grouped together, inconvenient district boundaries obliterated, and, if desirable, populous and rural areas kept distinct. Small urban areas within such districts could retain control of their roads to such an extent as might be found necessary.

No great change would be necessitated in the existing arrangements of the various county and district staffs. The Road Board would absorb many of the highly trained heads of county council departments, and thus find an outlet for the inexhaustible energies of those gentlemen whose one ambition apparently is to control the highways, byways, and other ways of England.

Probably one of the most desirable results from a professional point of view would be to prevent unqualified persons being appointed, as the Road Board would exercise similar powers to those now exercised by the Local Government Board in the appointment of sanitary inspectors and medical officers, and to fix reasonable salaries in place of those miserable doles now paid by some small councils. A further result would be a specialisation in road construction, as distinct from other branches of the engineering profession.

The author wishes it to be distinctly understood that he is in no way endeavouring to dogmatise, but simply to suggest an alternative scheme to the one put forward by the controlling body of the older association, and apparently acquiesced in by the members of that society.

DISCUSSION OF MR. WOODDISSE'S PAPER

A very brief discussion followed the presentation of Mr. Wooddisse's paper at the recent annual meeting of the Institution of Municipal Engineers.

Mr. G. F. TAYLOR (Warwick), proposing a vote of thanks, questioned whether it would be desirable to hand over the complete control of rural roads to the county councils, having regard to the amount of works which those authorities were already responsible for. None the less, rural surveyors would willingly give their support to any arrangement which would improve the existing conditions, while preserving their own rights. Mr. Wooddisse's paper set out the essential features of efficient highway administration, but these ideals were by no means obtainable at present. However district surveyors tried to adopt what he regarded as the best practice, they found their efforts nullified by the county councils. Bureaucracy was the enemy of efficient self-government, and the handing over of the highways to county surveyors would end inevitably in disaster.

Mr. F. W. POYNTER (Watford) seconded the vote of thanks.

Mr. J. BAILEY (Spalding), while not criticising the county councils, said he was convinced that county councils and their surveyors had in hand quite as much work as they could carry out efficiently. Had rural authorities, however, in years gone by, carried out their duties properly, county councils would not have attempted what they were doing. They were suffering from the lethargy of the past.

Mr. G. B. CHILVERS (Oundle) agreed that it was quite certain many of the rural district councils wanted waking up. Their methods were antiquated, and some had even yet to realise the necessity of steam rolling.

Mr. H. BOOT (Westminster and Tunbridge Wells) commented on the practice that existed of breaking [illegible]

* Paper read at the annual meeting of the Institution of Municipal Engineers.

[illegible]

SOME RECENT PUBLICATIONS.*

[illegible]

to stand by a draughtsman and explain in detail just [illegible] all-important details of proportion, scale, width of [illegible] this book will find it feasible to run through the [illegible] like the one he desires to have made from his own data. A simple chart placed before any draughtsman of average ability should give him practically all the instruction needed for the preparation of a simple [illegible] explains the point of view of the book. The diagrams are extremely well drawn, and afford excellent examples for students and others who are engaged in [illegible]

A Science [illegible] By [illegible] Limited.

[illegible] at University College, Dundee, and they here present [illegible] are in plan, as, for example, when used to support the balcony of a theatre. The first part of the book [illegible] sections. Chapter I. outlines the introductory [illegible] Chapter II., which deals with the equilibrium of the bow-girder. In Chapter III. the torsion of non-circular sections is considered, while Chapter IV. deals [illegible] combined with bending, and Chapter V. touches briefly upon the general principles of design of a bow-girder exposed to both bending and twisting. The work [illegible] important and intricate engineering problem.

[illegible] Year-book for 1915. Price 6d. nett. Manchester: Emmott & Co., Limited.

The twenty-eighth issue of this useful publication is on the same lines as its predecessors, and consists of a very useful and complete pocket-book of notes [illegible] limit gauges, and the strength of flat plates. The information in regard to toothed gearing and the gas engine has been revised and considerably extended, while many new tables and additional illustrations have been introduced. The whole forms a concise collection of practical information of great value to those engaged in mechanical and structural engineering work.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody
—Massinger "The Fatal Dowry," Act ii. 2

CONCRETE ROADS.

To the Editor of The Surveyor.

Sir, I [illegible] tributing towards the cost.

[illegible] I write this as I understand I was the first surveyor [illegible] a foundation for other material, the first reinforced-[illegible] Yours, &c.,

W. Matthews Jones.

Town Hall,
Chester.
December 11, 1914.

MUNICIPAL ENGINEERS AND THE WAR.

To the Editor of The Surveyor.

Sir, The letter from Mr. G. Bertram Hartfree in [illegible] young engineers who have volunteered for foreign service to increase their professional knowledge while in those countries may have particular application to Karachi, through the port of which so many of such [illegible] will pass. We [illegible] engineers will make themselves known, and we shall be pleased to grant facilities for works to be inspected.

[illegible] Karachi [illegible] epoch-making event as constituting the arrival of the first party of Territorial troops to land for foreign [illegible]

We had the pleasure of seeing some sixty of the officers of these battalions at our club last night, and [illegible] who had been chairman of committees on the Stonehouse Council, Plymouth, and who was able to give me news of Mr. Paton, of Plymouth, one of our respected past-presidents of the Institution of Municipal and County Engineers.—Yours, &c.,

William Lea, Assoc.M.Inst.C.E.,
Chief Engineer,
Karachi.

November 12, 1914.

[The above has been censored, but the regulations of the Press Bureau do not permit us to indicate the position of the deleted matter.—Ed. Surveyor.]

HIGHWAYS AND BYWAYS.

To the Editor of The Surveyor.

Sir, In an article headed as above in The Surveyor of the 11th inst., the writer thereof mentions [illegible] amounting to £100 being done to [illegible] length of main road under his charge to the neglect of a farmer to order that the wheels of his carts be scraped before coming from fields on to the road.

[illegible] it has occurred to the writer of the

[illegible] that if a road-man, cutting, say, £2 10s. [illegible] would apply to a case similar to the one quoted, but [illegible]

Yours, &c.

[illegible]

December 12, 1914.

WILTSHIRE SURVEYORS' ASSOCIATION.

The first general meeting of the Wiltshire Surveyors' Association was held at the Town Hall, Trowbridge, on Saturday last, the 12th inst., the [illegible] Mr. F. Gee (Pewsey urban district), A. E. Adams (Chippenham Borough), J. W. Brooke (Salisbury Rural), A. O. Crew (Devizes Main Roads), G. G. Moore (Westbury Urban), E. Dunham Davis (Lacock), R. F. Golding (Bradford-on-Avon Rural), J. Godfrey (Calne Rural), H. G. Nicholson-Lailey (Devizes Urban), A. H. Lapham (Chippenham Rural), A. F. Long (Warminster Main Roads), S. W. Saunders (Devizes Rural) and W. H. Stokes (Westbury Rural).

Letters of regret for inability to attend were received from Messrs. T. V. H. Davison (Tetbury), E. T. Hayman (Amesbury), W. H. Liddon (Malmesbury), D. W. Morrice (Salisbury Rural), H. C. Phillips (Mere), R. A. Skelton (Wilton Rural), and W. Smithland (Ramsbury).

Mr. H. G. Nicholson-Lailey was voted to the chair for the ensuing year, and the officials were elected to preside over the business of the ensuing year.

President: Mr. J. Geo. Powell, county surveyor.

Members of Council: Messrs. A. E. Adams, J. W. Brooke, A. O. Crew, J. W. Goodwin (Salisbury), J. Hamp (Swindon), H. G. Nicholson-Lailey, A. H. Lapham, and W. H. Stokes, the last-named being elected chairman of council, with Mr. E. Dunham Davis as hon. secretary.

It was resolved to hold [illegible] meetings each year, on the [illegible] March, May, [illegible] and the second Saturday in October. The March meeting [illegible] to be held at Chippenham.

A Surveyor's Dilemma. In the course of the last meeting of Kidderminster District Council the surveyor said he was in a great difficulty with regard to labour. He no sooner got men to take the place of those who had enlisted than they followed suit. There was not the last lot of men he had taken on. The chairman: I am rather glad. The surveyor: So am I in a [illegible] place for a [illegible] wage, but it is a serious one. The chairman: It will be more serious yet. The surveyor said the assistant surveyor was [illegible] to the country, and wished to know if his position would be kept for him. The chairman: [illegible] We will see what we can do for you.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of vacancies. Such advertisements may, in cases of emergency, only, be telephoned (City No. 1056) subject to later confirmation by letter.*

TEMPORARY ASSISTANT. — December 19th. — Cumberland County Council. £2 per week.—Mr. Willam Finch, county surveyor, The Courts, Carlisle.

BURGH SURVEYOR. December 19th. Oban Town Council. £150 a year.—Mr. A. S. Black, town clerk.

ASSISTANT. — December 21st. — Corporation of York. £100 a year.—Mr. F. W. Spurr, city engineer, Guildhall.

ASSISTANTS WATERWORKS MANAGER. December 21st. Corporation of Worcester. £2 per week. City Engineer.

HIGHWAY SURVEYOR. December 22nd.—Cookham Rural District Council. £2 2s. per week. Mr. W. Wood, [illegible] Chancery, Maidenhead.

HEAD GARDENER. December 23rd. Corporation of Lowestoft. £1 per week. Borough Engineer, Town Hall.

TEMPORARY ENGINEERING ASSISTANT. December 24th. Corporation of Mansfield. £3 per week. Mr. T. P. Collinge, borough engineer and surveyor.

PARKS SUPERINTENDENT. December 31st. Corporation of Mansfield. £100 per annum. Mr. F. Hudson, town clerk.

SURVEYOR'S ASSISTANT. December 27th.—Wath-upon-Dearne Urban District Council. £85 per annum. Messrs. Nicholson & Co., [illegible]

CLERK OF WORKS. December 28th. Gower Rural District Council. £3 per week.—Mr. H. J. Ind, clerk, Central Buildings, Fisher-street, Swansea.

BOROUGH SURVEYOR.—December 29th.—Corporation of Sandwich. £150 a year.—Mr. E. C. Byrne, town clerk.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

ASSISTANT ENGINEERS. April 1st. Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of vacancies. Such advertisements may, in cases of emergency, only, be telephoned (City No. 1056) subject to later confirmation by letter.*

DONCASTER.—January 23rd.—Designs for laying out a site of 20 acres for the erection of 102 workmen's houses, for the corporation.—Mr. R. A. H. Tovey, town clerk.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation.—Mr. Reginald Blomfield, R.A., has been [illegible] Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of vacancies. Such advertisements may, in cases of emergency, only, be telephoned (City No. 1056) subject to later confirmation by letter.*

Buildings.

HENDON.—December 21st.—For the erection of a rifle range, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

EASTBOURNE.—December 21st.—For the construction of a ladies' convenience, for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

PRESTON.—December 21st.—For the erection of baths and tramway offices and sheds, for the corporation.—Borough Surveyor.

ST. ANNE'S-ON-SEA.—December 21st.—For the construction of an open-air swimming bath, for the urban district council.—Mr. F. Harrison, architect, Willow-street, Accrington.

KEIGHLEY.—December 22nd.—For shed extension at Victoria Park, for the corporation.—Borough Engineer.

CHORLEY.—December [illegible]—For the erection of [illegible] and [illegible]—For the [illegible] Borough Surveyor.

SALFORD.—December 29th.—For providing and laying [illegible] of water mains, construction of tower, reservoir, and other works, for the rural district council.—Mr. W. B. Marsden, engineer and [illegible]

WYCOMBE.—December 24th.—For the erection of six houses, for the rural district council. Mr. A. L. Grant, building surveyor, 15 High-street, High Wycombe.

WEST SUFFOLK.—December 28th.—For the reconstruction of a bridge, for the county council.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

NANTWICH.—December 29th.—For the erection of eight workmen's houses, for the rural district council.—Mr. C. E. Davenport, architect, 152 Hospital-street, Nantwich.

EAST STOW.—December 30th.—For the erection of working-class dwellings, for the rural district council.—Mr. H. E. Wilkes, clerk, Council Offices.

BEBINGTON.—December 30th.—For the erection of a school, for the Sub-committee for Education.—Messrs. E. Kirby & Son, architects, 5 Cook-street, Liverpool.

UPTON-UPON-SEVERN.—December 31st.—For the construction of water supply works, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

DOCKING.—December 31st.—For the erection of six houses, for the rural district council.—Mr. J. A. Stoughton, clerk, Fakenham, Norfolk.

UXBRIDGE.—December 31st.—For repairs to hospital buildings and the erection of a laundry, for the Joint Hospital Board.—Mr. W. L. Eves, surveyor, 54 High-street, Uxbridge.

SURREY.—December 31st.—For the provision and erection of permanent buildings of light construction for school clinics and tuberculosis dispensaries, for the county council.—The Surveyor, County Education Offices, Penrhyn-road, Kingston-upon-Thames.

BATTERSEA.—January 1st.—For the erection of a dust destructor, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

PORTHCAWL.—January 4th.—For the construction of about 5½ miles of cast-iron mains, and other minor works, for the urban district council.—The Surveyor.

ALICANTE.—January 5th.—For the construction of the first section of the provisions market, for the municipality.—Commercial Intelligence Department of the Board of Trade, 73 Basinghall-street, London, E.C.

CHEPPING WYCOMBE.—January 5th.—For the construction of a ferro-concrete bridge on the Hennebique system, and laying a short length of sewer and surface-water drain, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

BINGHAM.—January 6th.—For the erection of six workmen's houses, for the rural district council.—Mr. C. W. Kendrick, sanitary surveyor, Bingham.

FAVERSHAM.—January 7th.—For laying cast-iron pumping main, supply mains, with all necessary fittings, and the construction of a new service reservoir, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster, S.W.

WANDSWORTH.—January 9th.—For an addition to a public library, for the borough council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

BRISTOL.—January 11th.—For the erection of a ferro-concrete tobacco warehouse, for the Docks Committee.—Mr. W. W. Squire, engineer, Cumberland-road, Bristol.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner.—Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

Iron and Steel.

CHORLEY.—December 23rd.—For the supply of galvanised steel ashbins, for the corporation.—Sanitary Inspector, Back-street, Chorley.

BURY.—December 28th.—For the supply of cast-iron castings, for the Joint Water Board.—Waterworks Manager, Parsons-lane, Bury.

SEVERN.—December 31st.—For providing, laying, and jointing about 4¼ miles of cast-iron water mains, with valves, hydrants, air valves, and the construction of engine-house and reservoir, for the rural district council.—Messrs. Willcox & Raikes, Union-chambers, 63 Temple-row, Birmingham.

DUNDEE.—December [illegible]—For the supply of structural steelwork, for the corporation.—Mr. H. [illegible] and [illegible] electricity work. Dead [illegible] [illegible]

BIRMINGHAM.—January 6th.—For the erection of the constructional steelwork comprised in boiler-house, engine-house, switch-house, and offices at Nechell's generating station, for the Electric Supply Committee.—Messrs. Harrison & Cox, Council Chambers, 109 Colmore-row, Birmingham.

CONWAY.—January 7th.—For the provision and [illegible] water [illegible] with valves, [illegible] and [illegible], for the rural district council. Mr. T. L. Oliver, engineer, Stanley Buildings, Conway.

Roads.

HERTS.—December 22nd.—For the supply of broken granite, slag, and tar-macadam, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

LASINGTON.—December 22nd.—For making up private streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

BURY (Lancs).—December 23rd.—For making up certain streets, for the corporation.—Borough Engineer and Surveyor.

STAPLEFORD.—December 23rd.—For making up a road, for the rural district council.—Mr. C. Raynor, surveyor, 115 Trent Boulevard, West Bridgford, Notts.

ROCHDALE.—December 23rd.—For making-up work and sewering, for the corporation.—Borough Surveyor.

SUNDERLAND.—December 24th.—For the supply of hand-broken whinstone, tarred limestone, whinstone chippings, and blast furnace slag chippings, for the rural district council.—Mr. T. Young, surveyor.

WESTBOURNE.—December 24th.—For the supply of granite quartzite, or other stone, for the rural district council.—Mr. H. Norris, surveyor, West Ashling, Chichester.

STOWMARKET.—December 28th.—For the supply of 69 tons of tar, for the urban district council.—Mr. G. W. Lingwood, surveyor, Butter Market, Stowmarket.

BILLERICAY.—December 28th.—For making up roadways and pathways, for the rural district council.—Mr. H. R. Bird, architect, St. Thomas's-gate, Brentwood.

ELGIN.—December 29th.—For the supply of road materials, for the county council.—Mr. E. D. Jameson, county clerk, Elgin.

HARWICH.—December 30th.—For the supply of 1,000 tons broken granite, as required from time to time, for the corporation.—Mr. F. Harold French, borough surveyor, 41 Church-street, Harwich.

HARWICH.—December 30th.—For steam rolling as required during the year, for the corporation.—Mr. F. Harold French, borough surveyor.

FLINTSHIRE.—December 31st.—For the supply of road materials, tar and cartage, for the county council.—County Surveyor, Mold.

BOGNOR.—December 31st.—For the supply of flat, straight granite kerbing, ditto circular, and composition paving slabs, for the urban district council.—Mr. J. Jubb, clerk.

SOMERSET.—December 31st.—For surface-tarring main roads, for the county council.—Mr. Edward Stead, county surveyor, Wells.

DERBYSHIRE.—December 31st.—For the supply of granite, basalt, slag, limestone, tarred macadam, tarred chippings,, and other suitable materials, for the county council.—Mr. J. W. Horton, county surveyor, County Offices, St. Mary's-gate, Derby.

PORTHCAWL.—January 1st.—For making up private streets, for the urban district council.—Mr. A. J. Oborn, surveyor.

CANNOCK.—January 1st.—For the supply of refined tar prepared in accordance with the specifica-

tion of the Road Board, for the urban district council.—Mr. R. Blackwell, engineer and surveyor.

BROMLEY (Kent).—January 8th.—For work to be executed on the permanent way of Montgomery-road, for the urban district council.—Mr. R. Cross, highway surveyor, Farnborough, Kent.

NORMANTON.—January 8th.—For work of widening and improving for the urban district council.—The Surveyor.

HUDDERSFIELD.—January 8th.—For the supply of a motor-driven street sweeping machine, with collecting van attached, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

BEXLEY.—January 5th.—For the supply of high-class materials and stoneware socketed pipes.—Mr. W. T. Howse, surveyor.

EASTHAMPSTEAD.—January 5th.—For the supply of granite slag (limestones), and flints, for the rural district council.—Mr. J. R. Treadwell, surveyor, Council Offices, Bracknell.

MIDDLETON.—January 6th.—For the supply of about 1,400 tons of 4 by 5 granite setts, for the corporation.—Mr. William Welburn, borough surveyor.

GLOUCESTERSHIRE.—January 9th.—For the supply of stone for main roads, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

LINTHWAITE.—January 11th.—For work of paving with granite setts on concrete, kerbing, flagging, asphalting, and other incidental work, for the urban district council.—Mr. Albert Mallinson, surveyor.

TRING.—January 11th.—For the supply of 12,000 gallons of refined coal tar complying with the Road Board's specification, for the urban district council.—Mr. S. S. Gettings, surveyor.

WOODSTOCK.—January 11th.—For the supply of best hand-picked unbroken stone, best broken stone (2-in. gauge), best double-screened nuts, and binding chippings, for the rural district council.—Mr. A. G. Higgs, clerk.

UCKFIELD.—January 13th–22nd.—For the supply of road materials, for the rural district council.—Mr. E. W. Ray Johnson, surveyor, Buxted, Sussex.

EAST GRINSTEAD.—January 20th.—For the sale of a steam roller, No. 2,711, by Aveling & Porter.—Mr. Charles Turton, surveyor, 6 High-street, East Grinstead.

GLOUCESTERSHIRE.—For surface tarring about 80 miles of main roads at various places, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

LOUGHBOROUGH.—For road works in certain streets, for the corporation.—Mr. A. H. Walker, borough surveyor.

WILTON.—For steam rolling various roads in the district, for the rural district council.—Mr. R. A. Skelton, district surveyor, Bemerton, Salisbury.

WILTON.—For the supply of a large quantity of 1½-in. and 2½-in. granite, for the rural district council.—Mr. R. A. Skelton, district surveyor, Bemerton, Salisbury.

Sanitary.

MIDDLESBROUGH.—December 21st.—For repairs and other sanitary work, for the corporation.—Mr. S. E. Burgess, borough engineer.

TEDDINGTON.—December 21st.—For the construction of tanks, channels, filters, and other works required in the extension of the sewage works, for the urban district council.—Mr. William Fairley, Parliament Mansions, Westminster, and Mr. Marshall Hainsworth, surveyor, Council Offices.

GLASGOW.—December 21st.—For the construction of sewers, for the corporation.—Office of Public Works, 64 Cochrane-street.

DURHAM.—December 23rd.—For sewerage works, for the rural district council.—Mr. G. Gregson, surveyor.

LOTHINGLAND.—December 23rd.—For the removal of house refuse and nightsoil, for the rural district council.—Mr. W. B. Forward, clerk, 148 London-road N., Lowestoft.

BIRMINGHAM.—December 24th.—For the construction of 1,550 yds. of brick sewer and 2 miles of stoneware pipe sewer, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

HUDDERSFIELD.—December 24th.—For the supply of sludge filter cloth, sulphuric acid, B.O.V., and petroleum benzine, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

HEEDEN BRIDGE.—December 24th.—For extensions to sewage disposal works, for the urban district council.—Messrs. John Newton, Son & Bayley, 19 Cooper-street, Manchester.

DONCASTER.—December 29th.—For scavenging privies and ashpits, and the removal of house refuse, for the rural district council.—Mr. H. Thirlwall, inspector, 7 St. George-gate, Doncaster.

WOKING.—December 30th.—For sewering certain districts, for the urban district council.—Mr. R. Mossop, clerk.

ASHFORD.—January 1st.—For works of drainage of the boys' playing field, for the managers of the West London District Schools.—Mr. J. L. Gosling, superintendent.

BULKINGTON.—January 2nd.—For the removal of nightsoil, for the urban district council.—Mr. H. W. Wilson, surveyor, Attleborough, Nuneaton.

MANCHESTER.—January 4th.—For the supply and erection of Venturi meters, cast-iron pipes, valves, and contingent works at Davyhulme sewage works, for the corporation.—Secretary, Rivers Department, Town Hall.

DOVER.—January 4th.—For the collection and disposal of house refuse, for the corporation.—Mr. W. C. Hawke, borough engineer.

GREAT HARWOOD.—January 9th.—For alterations and extensions at sewage disposal works, for the Joint Sewerage Board.—The Engineers, Martholme, Great Harwood, Lancs.

KILKENNY.—January 16th.—For the construction of main drainage, for the corporation.—Mr. J. F. Reade, engineer, 29 Baronstrand-street, Waterford.

DARLASTON.—January 21st.—For the construction of stoneware pipe sewers, manholes, cast-iron pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

CHAILEY.—January 29th.—For works of sewerage, for the rural district council.—Mr. H. Bertram Nichols, engineer, 11 Victoria-street, Westminster, S.W.

Stores.

GILLINGHAM.—December 22nd.—For the supply of road materials, Portland cement and lime requisites for precipitation works, stoneware pipes, timber, sewer ironwork, coal, coke, bricks, paints, oils, varnish, general stores, ironmongery, and disinfectants, for the corporation.—Mr. J. L. Redfern, borough engineer and surveyor.

HASTINGS.—December 28th.—For the supply of manhole covers, gullies, ash-collecting tubs, brooms and brushes, for the corporation.—Mr. P. H. Palmer, borough engineer.

SUNDERLAND.—December 29th.—For the supply of street lamps, fire hydrants, gullies, manhole covers, asphalting, kerbing, sanitary pipes, and disinfectants, for the rural district council.—The Surveyor.

WOMBWELL.—January 1st.—For the supply of wrought-iron steam tube and fittings, main cocks, pendants, brackets, brass fittings, brooms, and other sundries, for the urban district council.—Mr. P. D. Walmisley, engineer and manager, Gasworks, Wombwell.

WANDSWORTH.—January 1st.—For the supply of blue bricks, castings, cement, disinfectants, road materials, salt-glazed ware pipes, street lamp columns, vans, carts, woodpaving blocks, and house refuse collection, for the borough council.—Council House, Wandsworth, S.W.

SLOUGH.—January 2nd.—For the supply of gas mantles, Portland cement, distilled tar, screened shingle, and prepared tar-macadam, for the urban district council.—The Surveyor, 4 William-street, Slough.

Miscellaneous.

EPSOM.—December 21st.—For the supply of a trailer with tipping gear, suitable for a 5-ton steam tractor; also for a tank to put into the wagon, for the rural district council.—Mr. T. E. Ware, surveyor, Epsom.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance
; Provisionally accepted

[illegible] Kent-place.—W. F. Chadwick, Limited, Liverpool, £135.

[illegible] G. F. Tomlinson, Derby.

[illegible]

[illegible]	£1,14[illegible]
[illegible]	1,788
Gorton & Shapcott, Gloucester	3,470
F. W. Peer, Gloucester	3,451
[illegible]	3,422
Bowers & Co., Hereford	3,402
J. Byard & Sons, Gloucester	[illegible]
[illegible]	3,398
[illegible]	3,379
W. Jones, Gloucester ..	3,229
[illegible]	3,088

[illegible]

No. 1.

[illegible]	[illegible]
[illegible]	5,450
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	4,474
R. Turner, Holmfirth	4,192
[illegible]	4,127
[illegible]	3,960
[illegible]	3,945
[illegible]	3,937
[illegible]	3,667
[illegible]	3,628
J. Cooke, Huddersfield	3,475
[illegible]	[illegible]
[illegible]	[illegible]

Engineer's estimate [illegible]

No. 2.

[illegible]	[illegible]
A. & J. Hyslop, Manchester	2,145
J. Kenyon, Holmfirth ..	2,100
[illegible]	2,045
W. Brigg, Bradford	1,995
[illegible]	1,907
[illegible]	1,888
A. Graham, Huddersfield	1,838
[illegible]	1,830
[illegible]	1,816
[illegible]	1,802
B. Gill, Holmfirth	1,799
R. Turner, Holmfirth	1,792
[illegible]	[illegible]

Engineer's estimate [illegible]

HOVE.—For the construction of a public lavatory, for the corporation.—Mr. H. H. Scott, borough surveyor.
McKellar & Westerman, Church-road, Hove, £108.

HOVE.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor:—
Langdale-road.—McKellar & Westerman, Church-road, Hove, £1,027.
Lansdowne-road.—J. Parsons & Sons, Church-road, Hove, £186.

LEWISHAM.—For supplying and laying wood paving in Perry-vale, for the borough council.—Mr. E. van Putten, borough surveyor.

	Per yard super s. d.
W. Griffiths & Co., Limited	16 0
Acme Flooring and Paving Company, Limited	15 [illegible]
Fry Brothers, Limited	15 6
Improved Wood Pavement Company, Limited ..	15 [illegible]
J. Mowlem & Co., Limited	14 11

MALDON.—For the construction of the Tollesbury waterworks, for the rural district council.—Mr. W. Almond, engineer and surveyor.

Engine Shed, Foundations of Overhead Tank and Fencing.—J. Rayner, East Hanningfield, £397.
Overhead Tank on Open Steel Staging.—Wilson & Co., Frome, Somerset, £487.
Suction Gas Plants, Gas Engines and Deep Well Pumps in Duplicate.—Ruston, Proctor & Co., Lincoln, £1,067.
Provision and Laying of Water Main.—W. Price & Son, London, £1,456.

ROCHDALE.—For making up certain streets, for the corporation.—Mr. S. S. Platt, borough surveyor:—
Contract No. 443.—R. & T. Howarth, Rochdale.
Contract No. 444.—S. Kearsley, Rochdale.
Contract No. 445.—J. Horrocks, Westhoughton.

THE CHRISTMAS HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in next week's issue of "The Surveyor" must reach us not later than Wednesday morning, December 23rd.

TENBY.—For the erection of a school, for the Education Authority.—Mr. O. T. Thomas, architect, Haverfordwest:—

Davies Brothers, Tenby	£7,056
[illegible]	7,050
D. John, Pembroke Dock	6,947
[illegible]	6,670
D. Davies & Sons, Cardiff	6,145
[illegible]	6,088
W. [illegible]	5,987
W. H. Phillips, Tenby	[illegible]

WAKEFIELD.—For forming private streets, for the corporation.—Mr. J. P. Wakefield, city surveyor.

[illegible] & Sons, Wakefield.
Wilson Brothers, Wakefield.
[illegible] & Lasslett, Wakefield.

APPOINTMENTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1016) subject to later confirmation by letter.*

PORT-OF-SPAIN CITY COUNCIL.

The Council invites applications for the combined post of City Engineer and Engineer of the Port-of-Spain Water and Sewerage Works.

2. The salary attached to the post of City Engineer is £400 a year, and to that of Engineer of Water and Sewerage Works, £50 a year, with travelling allowance at the rate of £75 a year.

3. The intention of the Council being that the two posts of "City Engineer" and "Engineer of Water and Sewerage Works" should be held by the same person, every application must be for the two posts combined.

4. The offices are pensionable under the Port-of-Spain Corporation Ordinance, 1914.

5. The appointment, so far as concerns the post of Engineer of Water and Sewerage Works, is subject to the approval of the Governor.

6. Candidates must be corporate members of the Institution of Civil Engineers of England, and must possess experience in the design, construction, and maintenance of waterworks and sewerage systems.

7. Applications, accompanied by not less than three recent testimonials, and stating age and previous experience, must be supported by satisfactory evidence that the candidates possess the qualifications set forth in the preceding paragraph of this notice, and must be forwarded so as *to reach the undersigned not later than the 31st January, 1915.*

8. Candidates must also forward with their applications a medical certificate of fitness for service in the West Indies.

9. The successful candidate will be required to furnish a bond with an approved surety in the sum of £500 for the due performance of the duties of the above offices. He will be required to devote his whole time to the service of the Corporation, and to reside in the City of Port-of-Spain, or within one mile of the limits thereof; and he must be prepared to enter upon the duties of the appointment within one month from the date of the receipt by him of the official notice of his appointment.

JOSEPH ARNOLD LAMY,
Town Clerk.

Town Hall,
Port-of-Spain,
Trinidad, B.W.I. (2,128)

WATH-UPON-DEARNE URBAN DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of Assistant in the Surveyor and Water Engineer's Department. Whole time to be devoted to the duties of the Office. Commencing salary, £85.

Candidates must be qualified by examination, and have had experience in a Municipal Engineer's Office.

Applications, in candidate's own handwriting, accompanied by not more than three (copies of) testimonials, to be sent to Mr. J. H. Drew, Engineer and Surveyor, Town Hall, Wath-upon-Dearne, not later than December 27, 1914, endorsed "Assistant."

NICHOLSON & Co.,
Clerks to the Council.

December 12, 1914. (2,169)

BOROUGH OF MANSFIELD
TEMPORARY ENGINEERING ASSISTANT

Applications are invited for the appointment of a Temporary Assistant in the Borough Surveyor's Office at a salary of £2 per week. Assistant's duties [illegible] Draughtsman, assistant Surveyor and Levelling and must have previous experience in a Borough Surveyor's Office.

Applications stating age and experience [illegible] accompanied by copies of three recent testimonials, and endorsed "Engineering Assistant," to be addressed to the undersigned [illegible] than Thursday, the [illegible] of December, 1914.

P. P. COLLINGE, [illegible]
Borough Engineer and Surveyor.

Mansfield.
December 8, 1914. 2 [illegible]

WANTED, in the City Engineer's office, York, an Assistant with Municipal experience. Commencing salary £[illegible] per annum.

Applications to be made on a Form to be obtained from the undersigned, and to be sent in not later than Monday, the [illegible]

F. W. SPURR,
City Engineer.

Guildhall, York.
December 12, 1914. 2 [illegible]

RESIDENT ENGINEER required at once to [illegible] employed in the Midland [illegible] Sewerage and Sewage Disposal Works (Bacterial Treatment), Pumping Station, Machinery, and Boiler Department. The work will take about [illegible] years to complete.

Only persons having [illegible] experience in this class of work need apply.

Applications, stating age, previous experience, and other [illegible] together with the references to be [illegible] Box 1,[illegible] care of The Surveyor, 21 Bloomsbury [illegible], E.C. 2 177.

Calno
Reg^d

THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300lb. to the square inch.

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

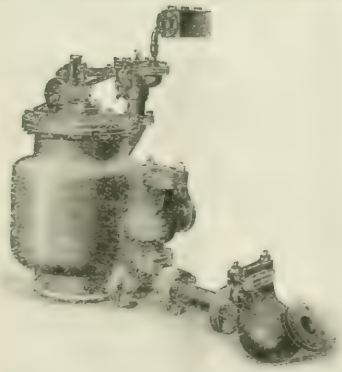
Sanitary.

Over 5,000,000 (five million) Square Feet in use by H.M. Government.

[illegible]
Address: **Thames Mills, Purfleet, Essex**
Telephone: [illegible] Purfleet. Telegrams: "Boards, Purfleet."

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,
Grams: "Antiflam, London." 26 Hart Street, London, W.C.

"J. & A." Pneumatic Ejectors.



As installed for raising sewage at--

ALDERMASTON, nr. Reading.
BINGLEY, Yorks.
ASHTON-IN-MAKERFIELD, Lancs.
West London District Schools, ASHFORD, Middlesex.

. High Efficiency .
Minimum Attention
. Easily Handled .

Low running and prime costs.

Write to-day for Ejector Catalogue S2.

Jones & Attwood, Ltd., HYDRAULIC ENGINEERS, STOURBRIDGE.

Telegraphic Address: "HEAT, STOURBRIDGE." Telephone: No. 10.

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those respecting the Under Mentioned are recommended to arrange that they shall reach THE SURVEYOR Office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of advertisements. Such advertisements may, in case of emergency, *only, be telephoned (City No. 1046) subject to later confirmation in writing.*

DERBYSHIRE COUNTY COUNCIL.

TENDERS FOR ROAD MATERIALS.

Tenders are invited for the Supply of Broken Stone required for the Maintenance of the Main Roads, namely:

Granite,
Brick,
Slag,
Limestone,
Tarred Macadam,
Tarred Chippings,

or other suitable Materials, delivered at various Railway Stations and Wharves in the County during the year ending the March, 1916.

Form of Tender and Conditions of Contract may be obtained at my Office, and will be forwarded through the post on receipt of a stamped addressed large foolscap envelope.

Tenders for Tarred Macadam must be upon a Special Form, for which application must be made.

Tenders are to be delivered to me not later than Thursday, December 31st, 1914.

The lowest or any Tender will not necessarily be accepted, and the Committee reserve the right to accept the whole or any part of a Tender.

J. W. HORTON, ASSOC.M.INST.C.E.,
County Surveyor.

County Offices,
St. Mary's Gate, Derby.
December, 1914. (2,153)

THE CORPORATION OF MIDDLETON

invite Tenders for the Supply of about 1,400 tons of 1cwt Granite Setts.

Further particulars and Form of Tender, which must contain a list of Sites, copies of which may be obtained on application to Mr. William Welburn, Borough Surveyor, Town Hall, Middleton.

Tenders to be addressed in official envelope to the Chairman of the Surveyor's Committee, accompanied by Samples, and endorsed "Granite Setts," must be delivered at my Office not later than January 6th, 1915.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton.
December 15, 1914. (2,176)

TRING URBAN DISTRICT COUNCIL.

TENDERS FOR REFINED TAR.

The Tring Urban District Council invites Tenders for the Supply of 12,000 gallons (more or less) of Refined Coal Tar, complying with the Road Board's Specification for Tar, No. 1, delivered to Tring Station, carriage paid, in Contractor's own barrels, as required by the Council between the 1st April and the 30th June, 1915.

General Conditions and Forms of Tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Tar," must be delivered to A. W. Vaisey, Esq., Clerk to the Council, Tring, not later than noon on Monday, the 11th January, 1915.

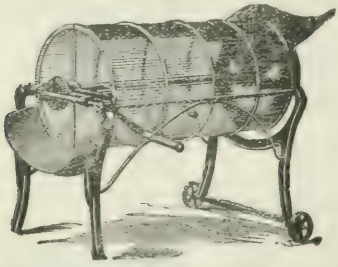
The Council do not bind themselves to accept the lowest or any Tender.

S. S. GETTINGS, ASSOC.M.INST.C.E.,
Surveyor.

Surveyor's Office,
Tring.
December 15, 1914. (2,175)

SHEATH BROTHERS,
MANUFACTURERS & PATENTEES.
ESTABLISHED 1845.
Speciality—
EXTRA STRONG HOSE
FOR HARD WEAR.

Illustrated Price List and Samples on application.
87 CITY ROAD, LONDON, E.C.



ROTARY SCREENS IN MESHES
Suitable for GRAVEL, SAND, &c., &c.
PENNEY & CO., Ltd., Screen Makers, LINCOLN.

VOIDLESS ASPHALT MACADAM

The Premier Road for Modern Traffic.

Embodies all the essential features of an ideal road.

Write for Booklet—
"Voidless Asphalt Macadam."

HIGHWAYS CONSTRUCTION, LTD.
FINSBURY COURT,
LONDON, E.C.

The Surveyor

And Municipal and County Engineer.

Vol. XLVI. DECEMBER 25, 1914. No. 1,197.

Minutes of Proceedings.

Limited Dedication of Highways.

One of the leading principles governing the law as to the dedication of highways is that a landowner who dedicates part of his land as a highway may impose reasonable restrictions on the exercise of the public rights. In other words, there may be what is termed a "limited dedication." In this respect the law was left unaffected by the Highway Act, 1835. Sec. 23 of that Act merely altered the previously existing law as to the liability of the parish for the repair of highways (so far as regards roads not previously dedicated), by making formal dedication, in the prescribed method, a condition precedent to such liability. But the Act left untouched the law as to the mode in which public rights over a road may be acquired without formal dedication. The grounds on which the principle to which we have referred is based were stated by Mr. Justice Blackburn in a case heard before him in 1862 (*Fisher* v. *Prowse*, 2 B. and S. 770), and may be thus summarised: It is not obligatory upon an owner to dedicate his land as a public highway, nor is it compulsory on the public to accept it. If it is offered subject to certain reservations, and the public accept it in such circumstances, there can be no injustice in holding them to the terms on which the benefit was conferred. On the other hand, great injustice would often arise if the landowner should be bound to alter the state of circumstances to his own disadvantage and loss. The authorities show, however, that this principle must be construed reasonably, and it is not likely that it would be interpreted as permitting a restriction which was so obviously unreasonable or merely capricious as to be repugnant to the right actually granted.

It will, we think, be of interest briefly to note, by way of illustration of the principle, one or two specific instances of "limited dedication." In the first place, a road may be dedicated subject to an existing erection on or excavation near it, and the dedication will be taken to have been made to the public and accepted by them, subject to the inconvenience or even risk arising from such a state of things. Hence the following drawbacks have been held to be lawful: A cellar-flap projecting slightly above the footway; a flight of steps leading to the door of a house and partially obstructing the way; a bridge so low as to be dangerous to persons driving under it in vehicles; an unfenced declivity; gates and stiles. Secondly, a road may be dedicated subject to rights previously granted by the landowner or his predecessors to other persons. As instances of these may be mentioned the right to hold a market, or to erect booths during a fair, leaving sufficient space for free passage along the highway, and the right of the occupiers of adjoining premises to deposit goods in front of their premises. So a sea wall over which there is a public right of way may be under the control of Commissioners of Sewers or others having statutory powers which are paramount to the public right. Or, again, the rights of the public to use a swing bridge across the entrance to a dock may be limited by the right to hold up the traffic for the passage of ships to and from the dock.

Thirdly, conditions as to the mode and time of the public user of a way may be imposed. For instance, it may be dedicated as a bridleway only (*i.e.*, a way not to be used with carts and carriages), or as a footway; or as a carriageway not to be used as a driftway (*i.e.*, for driving cattle); or even as a carriageway to be used for all purposes save the carriage of coals. So a bridge may be dedicated to be used on foot and with horses at all times, but not with carriages, except in times of flood or frost, when a neighbouring road may be dangerous or impassable. Fourthly, in dedicating either may reserve to himself the right of occasionally interfering with the use of the way. Thus a footpath across a field may be dedicated subject to the right to plough it up periodically in due course of husbandry; or a road may be dedicated subject to the right to cut a channel across it in time of flood. Whether an owner can, without a Royal grant or statutory powers, dedicate a road to the public subject to the right to levy tolls seems to be an open question. But where a road has been used and toll paid to the owner of the soil from time immemorial, there being no evidence to show that the public had a right of passage before the toll was claimed, the Court will infer a legal origin for the toll.

The Purification of Dairy Wastes.

[illegible] ordinary intelligent labourer, and will need very little [illegible] solved by the engineer in designing small purifi- [illegible] of works which shall need little attention. He must have in mind not only efficiency of treatment, but also the almost inevitable ignorance and neglect of the person responsible for the [illegible] suitable method of preliminary treatment for [illegible] attention than natural sedimentation. It is quite true that septic tanks are unsuitable, more particularly because they induce the formation of acid in the liquid, and thus prevent the proper bacterial action in the filters. We are not satisfied that it is difficult to design a tank for natural sedimentation, without the use of chemicals, in which the solids in suspension can be arrested without the formation of acids, and in this connection we do not agree with the recommendation that the total volume of the wastes should be reduced to as small a volume as possible. Rather would we suggest that the [illegible] apparatus should be mixed with the stronger liquids, so as to dilute them to the greatest possible extent. If this is done, and a *properly designed* tank provided, the matters in suspension can be removed without using chemicals, and a tank effluent produced which will be very suitable for the subsequent treatment on filters.

The construction of percolating filters with a depth of 12 ft., as recommended by Mr. Kershaw, also creates difficulties. In most cases it will necessitate the provision of pumping plant, thus increasing the cost both of construction and for maintenance. Further, if in order to reduce the amount of supervision required the total daily volume of the wastes is pumped up in a short time each day, this will have a harmful effect upon the treatment in the tanks and filters. If, on the other hand, the period of pumping is spread over the whole working period of the creamery, it involves considerable additional supervision. It is not impossible to provide very efficient filtration in a depth of much less than 12 ft., and in this way the whole of the works can be operated by gravitation. As already stated, the problem is beset with difficulties, and we are glad to have had the opportunity of dealing with the subject on the present occasion, as we hope that any of our readers who have had to do with works of this kind will communicate the results of their experience for the benefit of others who may be faced with the problem either now or at some future time.

* * *

Professional Etiquette.

In the discussion of questions of discipline among the members of a profession the ranks of which are not "closed" comparison is often made with the superior position of the "closed" professions in regard to the matter. In making such a comparison, however, the actual sanctions by which discipline may be enforced in the latter cases are not always clearly kept in mind. In the first place there is the power of a highly organised public opinion, the fear or pressure of which is in most cases sufficient to act as an effective restraining influence. The ultimate sanction, however, is the power which rests with some legally constituted governing body, consisting of members of the profession concerned, to punish those who are guilty of conduct which is scandalous in a professional respect by suspending them from practice. In the case of any profession which, like that of engineering, is an open one, the latter form of procedure is obviously impossible, except in the extreme case of disability may result in expulsion from a professional institution. It would appear, therefore, that all possible steps should be taken to secure that professional public opinion should make itself felt in every possible way. That such public opinion among engineers is not strong enough to secure compliance with a rule of conduct laid down by the Institution of Civil Engineers is shown by the contents of a circular just issued by that body.

In the early part of this year the institution issued a circular deprecating "the practice which exists among local authorities of inviting, by advertisement, engineers to submit in competition with others *their terms* for preparing plans and proposals for certain engineering schemes, [illegible] estimates of the cost of the works proposed." Within eight months of the issue of this circular the Eastern Valley (Monmouthshire) Joint Sewerage Board issued an advertisement inviting the submission of terms for certain professional engineering services. In spite of the rule laid down by the institution, and in direct contravention of it, a number of corporate members were found ready to reply to this advertisement, and in the circular which has just been issued it has been found necessary to remind them and others that their having done so constitutes an action of professional misconduct, which renders the offenders liable to expulsion from the institution. We agree with one correspondent, who in our issue of last week, under "Things One Would Like to Know," expressed the hope that the culprits were all very junior members of the profession. To them we would say that in engineering, as in every profession, the years of waiting are weary, but if they are passed patiently, and with the firm resolve honourably to uphold the best interests of the profession as a whole, the reward of the future will be both greater and more sweet.

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The Salaries of Limerick County Surveyors.

The Limerick County Council appear to have acted well within their discretion in raising the salaries of their two county surveyors from £300 to £475 per annum, for, as has already been pointed out, the first figure, including as it did all the heavy personal expenses involved in the pursuit of the officers' professional business, was quite inadequate. The council, however, have incurred the ire of a considerable body of ratepayers in making their decision, and especially they have brought down upon their heads the fierce anger of the Kilmallock Farmers' Association, who have presented to the Kilmallock Rural District Council a resolution protesting against the increases. Incidentally it may be mentioned that to describe the vote of the county council as an increase of salary is something of a misnomer. It really amounts to a recognition that the sum hitherto

paid to the county surveyors, seriously diminished as it was by out-of-pocket expenditure, was insufficient for the work performed. We note that at the Kilmallock meeting, at which the view of the agriculturists was so forcibly expressed, Mr. Bennett, a member of the Limerick County Council, while not saying that the salaries of the county surveyors were adequate, objected to the amount of the increase before the county council could have any assurance that they discharged their duties in a satisfactory manner." Such evidence is beside the question. At best it would appear to be merely an effort on the part of Mr. Bennett in compromising between his duty as a member of the county council and saying things agreeable to the Kilmallock farmers. It is the prerogative of the Limerick County Council to appoint fit and proper persons to the office of county surveyor, and we have not the least doubt that in this instance they have made their choice wisely and well. It is just as exasperating the part taken by the county council to declare that the office of county surveyor shall carry a salary befitting the importance of the services rendered, and in this regard we hope they have also decided wisely and well. Anyway, it is clearly the duty of the county council to see to it that, having made a deal for properly remunerating their surveyors, they will not stultify themselves by making concessions to the ill-informed clamour that was voiced at Kilmallock.

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Highway Engineering as a Profession.

The influence of modern mechanically propelled traffic on the methods of road construction and maintenance has been so great, and the problems raised by its advent have been so many and complex, that highway engineering may now fairly be considered as a highly specialised branch of the engineering profession. This fact has been recognised not only by the institution of special examinations, such as that recently undertaken by the Institution of Municipal and County Engineers, but also by the provision of special educational facilities for those desirous of embracing highway engineering as a profession. We have before us as we write the prospectus of courses in highway engineering and allied subjects leading to the degree of Master of Arts at Columbia University in the City of New York. The courses have been arranged with due regard to the convenience of students engaged in practical work who can only go into residence by obtaining leave of absence, and the work of the two sessions necessary to secure the degree has been designed so as to cover every phase of highway engineering both theoretical and practical. Among the subjects dealt with during the first session are road surfaces, highway bridges, mechanical appliances, the mining, manufacture and testing of bituminous materials, and engineering geology; while the second session includes special pavements, highway law, and laboratory courses in the testing of materials both bituminous and non-bituminous. It will be seen at once that such courses of instruction will be of the greatest value, and the scheme has the enthusiastic support of many of the foremost highway officials and engineers in the United States. Would it not be possible for some of our modern universities to undertake similar work?

* * *

The Military and the Roads.

From the time when the war broke out in August last we have repeatedly insisted upon the necessity for local authorities and their engineers doing all in their power to co-operate with and assist the military authorities, and with this object in view our columns have always been open for suggestions as to the forms such assistance should take. At a very early stage our readers were reminded that by attending to roads likely to be used for purposes of transport, local authorities would not only be assisting directly in the accomplishment of the great task which the nation has in hand, but at the same time they would in the long run be saving the pockets of their own ratepayers. A complaint which was made at the last meeting of the Crewe Borough Council shows that the advice has not been taken to heart in all cases. The gist of the complaint was that, owing to the heavy military traffic, a certain road had been "done up" and rendered impassable, and that in consequence of this the whole of the traffic had been transferred to another road, which would very shortly get into a similar condition. The member who raised the question very properly pointed out that the whole trouble might have been avoided if the road had been remetalled when the wear and tear first became evident. Now more drastic measures will have to be adopted unless the use of either road is to be denied both to the military and the public. These are eminently cases in which "a stitch in time saves nine."

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City of London Sanitary Company.

An appeal is being made for recruits for the 1st London (City of London) Sanitary Company (T.F.). Men of the company have been at the Front for some time past, and further sections are at present under orders for duty with the Expeditionary Force. These sections, which consist of an officer, a staff-sergeant, two sergeants, two corporals and twenty men, are going fully equipped for laboratory work, examining and sterilising water, disinfection and general camp sanitation work. The formation of the sections has absorbed the Imperial Service Company and the majority of the 1st Reserve Company, and it is therefore necessary to raise further reserve companies, sections of which will have the prospect of going abroad almost immediately. All recruits must be prepared to sign on for Imperial Service, and men from municipal engineers', architects', and public health offices, or from similar private offices, who possess satisfactory sanitary qualifications, are eligible for immediate promotion to N.C.O. rank. Pay is at the usual Army rates, with additional corps pay. Applications should be made, either personally or by letter, to the officer commanding 1st London (City of London) Sanitary Company (T.F.), Room B6 (Turk's-row entrance), Duke of York's Headquarters, Chelsea, S.W.

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An Architects' and Surveyors' Training Corps.

The council of the Surveyors' Institution have been asked by the promoters of the Architects' Volunteer Training Corps to give it their official recognition, and to bring its objects to the notice of their members. The council are persuaded that the corps is fulfilling a useful office, and urge all members in the London district and suburban area who are eligible, and who have not already joined a military organisation, to give it their support. Even those who are unable to train can render assistance by becoming members and by assisting the corps to obtain and classify recruits, and advise men wishing to join the Regular Forces of the units most suitable to their knowledge and physical ability. It is proposed that the title of the corps—whose headquarters are 18 Tufton-street, Westminster—should be changed to "The Architects' and Surveyors' Training Corps," but this still lacks official confirmation.

The Purification of Dairy Wastes.—(1).

By G. BERTRAM KERSHAW, M.A.M.Soc.C.E., M.Inst.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

In none of our industries has there been more expansion during the last few years than in the dairying industry. There is still room for further expansion, and with the advent of fresh depots, it behoves us to intelligently see to it that the wastes produced shall be purified before admission to a stream or river. Before describing the various wastes it may be well to state briefly the various classes into which the industry may be divided.

In this country the industry may be classified as follows: Dairies, creameries, cream-separating stations, and butter factories.

Creameries may be defined as places where creamery butter is made. There are two varieties. In the British Isles a creamery is a depot where milk is taken from the farmers, centrifugally separated, and the cream therefrom churned into butter. Such a depot in the Australian Colonies would be termed a milk factory. A creamery in Australasia usually means a factory where cream (mostly centrifugally separated) is received from the farmers and is made into butter.

In Ireland a central creamery usually receives cream from one or more separating stations established in the surrounding district for the convenience of the milk suppliers.

At cream-separating stations the cream is separated from the milk, the cream being sent to a creamery for churning.

At butter factories blending of butter takes place, the butter being sent to the factories by farmers.

In addition, at some branches cheese-making and the manufacture of condensed milk is carried out, while one or more of the different classes of the industry may be found at one depot.

In the States the dairy industry comprises dairying, skimming stations (corresponding to the English cream-separating stations), milk depots creameries (including butter factories), milk sugar factories, and renovated butter factories.

In many of the foregoing branches very polluting waste liquids are produced, and some of them are difficult to treat.

In the case of small dairies, such as may be found attached to small farms, the wastes are mainly derived from the washing of various utensils which have been used for holding and transferring milk, while other by-products—*e.g.*, separated milk, &c.—are fed to stock on the farm. Further, the wastes derived from the washing of utensils are small in volume, and can always, or nearly always, be disposed of by distribution on grass or garden land, and nuisance is not likely to arise from pollution of streams.

At cream-separating stations the cream is separated from the milk, to be subsequently conveyed to the creamery or churning station, the separated milk being returned to the farmers for feeding calves and pigs. It may be mentioned, in passing, that the usual mixing of the various blends of separated milk at the separating station cannot be viewed as satisfactory, since, in the event of infected milk being supplied, the whole of the separated milk returned to the various farmers may easily become contaminated unless Pasteurised.

Large volumes of waste liquids are produced at creameries, some of them polluting—*i.e.*, capable of absorbing large quantities of dissolved oxygen from water—while part of the used water is practically clean, and can be either discharged without treatment, or utilised for diluting the stronger liquids, if this should be deemed desirable.

The polluting liquids consist mainly of washing-water used in connection with separators, coolers, tanks, butter-workers, and churns, together with the rinsings of milk cans, &c.

These liquids are capable of taking up very large quantities of oxygen, and if discharged without purification into a small stream are liable to cause considerable nuisance from smell and fungoid growths in hot weather, besides rendering the water of the stream unfit for purposes involving the use of clear water.

The worst of the wastes is usually the first washing from the churning operations.

Coming to the non-polluting wastes. These consist of refrigerator and cooling waters; and, unless it is desired to dilute the stronger wastes with them, they can be turned into the rain-water drains. As a general rule, however, they are mixed with all the other waste liquids.

The combined liquid wastes from a creamery have the appearance of milky water, and they soon become highly putrefactive, containing casein, albumen, fat, lactic acid, and milk sugar.

The volume of wastes produced at a creamery varies in volume at different seasons of the year, being greatest in the warmer months; again, the volume is largely affected by the presence of a plentiful water supply, or the reverse; also whether clean waters are mixed with the dirty wastes.

Generally speaking, the total volume of waste liquid produced at a creamery varies from about two-thirds to four-fifths of the raw milk dealt with, while it sometimes equals it in volume; thus it is generally safe to assume for purposes of calculation that a creamery working under normal conditions, and dealing with, say, 6,000 gallons of milk a day in the "flush" season, will have some 5,000 to 6,000 gallons of waste liquid per twenty-four hours to be dealt with.

Regarding the composition of the various wastes derived from the dairy industry, Mr. Walter Thorp, F.I.C., the well-known authority on dairy products, gives the following figures of analysis as being representative of a strong dairy sewage, where the volume of clean water used is kept as low as possible:—

	Parts per 100,000.
Nitrogen in suspended matter	26·32
Nitrogen in soluble matter	12·40
Total nitrogen	38·72
Suspended solids	235·00
Dissolved solids...	385·00
Total solids	620·00
Total chlorine in solution	19·25

The following figures* refer to representative analyses of creamery wastes from various sources in America:—

Parts per 100,000.

Nature of sample.	Oxygen consumed	Organic N.	N. as free ammonia.	Acidity to phenol-phthalein.	Suspended matter.
1. Composite sample from cream-separating stn. *	96·6	24·9	·40	51·8	—
2. as above	284·5	25·0	1·70	—	—
3. as above ..	75·1	11·5	1·40	23·0	—
4. as above ...	49·4	5·8	·16	14·2	—
5. as above .	10·7	5·2	·16	30·3	—
6. Composite sample from butter factory	18·0	8·0	·25	54·4	247·5
7. Chance sample	51·2	1·8	·21	—	—
8. Equal parts skimmed milk and water ...	780·0	198·0	6·00	—	
9. One part skimmed milk and 35 parts water ...	42·5	24·0	1·05		
10. Average sample, butter factory	147·0	48·0	·24	24·0	—

* *i.e.*, "Average."

From the foregoing figures it will be seen that dairy wastes comprise liquids varying considerably in character and strength, and these variations must be provided against in any purification scheme.

The uniform attainment of a standard having limiting figures of, say, 3 to 4 parts per 100,000 of suspended matter, and similar figures for dissolved oxygen taken up from water in five days at 80 deg. Fahr. (27 deg. Cent.), should be within the reach of all concerns possessing a properly designed purification plant, and also competent supervision.

The writer, when engineer to the Sewage Disposal Commission, visited many dairy purification plants, and in every case which came under survey it was apparent that works had been put down under the assumption that a liquid similar to ordinary domestic sewage had to be dealt with, instead of a

* The Disposal of Wastes from the Dairy Industry. A. Elliott Kimberley. Quarterly Bulletin. Ohio State Board of Health.

liquid of extremely complex and variable character, many times stronger in most respects than the strongest of domestic sewages.

It cannot be too clearly realised that the satisfactory treatment of most trade wastes stands in an altogether different category from sewage treatment, and that the policy of putting down purification works which have elsewhere proved successful for totally different types of liquid to the one in question on the "ready-made" principle is one which is bound to end in failure.

In dealing with trade wastes, a good practical working knowledge is needed of the whole subject, since dealing with a particular waste knowledge acquired in treating other wastes may often prove beneficial. Further, special regard must be had to local conditions, and it is quite useless to install expensive apparatus requiring constant supervision in country districts far removed from towns.

A good deal has been done in other countries, particularly in America, concerning the purification of creamery wastes, but in this country few systematic investigations appear to have been made.

It may be well, before going further, to mention briefly some of the work done in connection with dairy wastes.

In America Mr. A. E. Kimberley, as the result of investigations carried out at the instance of an Ohio Commission, found that, if the river receiving the waste was about thirty times the volume of the waste liquors, dairy wastes could be discharged after treatment in settling tanks holding a two days' supply, while in other cases dairy wastes might be purified by intermittent sand filtration at a rate not in excess of 25,000 gallons per acre per twenty-four hours, until incapable of putrefaction.

In Germany irrigation of land by dairy wastes is often employed, the wastes being first settled in tanks, sometimes with the addition of chloride of lime.

Guth states that not more than a cubic metre (about 220 gallons) of liquid should be applied to half a cubic metre (about two-thirds of a cubic yard) of filtering material, while Dunbar considers that an effluent from a dairy, if not too concentrated, can be purified by ordinary biological processes, and most successfully by means of continuous percolating filters.

Harm appears to have obtained good results by precipitation with acid silicates.

Dr. H. M. Wilson considers that about 5,000 gallons of fairly strong waste can be treated per acre of suitable grass land per twenty-four hours.

The writer has made experiments on the treatment of dairy wastes, employing precipitation with certain precipitants as a preliminary process, the resulting tank liquor being passed through a small clinker filter 12 ft. deep, at the rate of about 30 to 40 gallons per cube yard per twenty-four hours.

The effluents obtained by this means were quite clear, almost free from suspended solids, and took up less than 2 parts of oxygen per 100,000 from tap water in five days. In other words, the effluents would have come well within a standard of the stringency recommended by the Sewage Commission in their Eighth Report.

The main point in the treatment of dairy waste lies in the preliminary treatment, which should be thorough, and it is probably practically useless to attempt sedimentation without the aid of precipitants; further, all precipitants are by no means of equal efficiency for dairy wastes. Septic tank treatment has been tried, but it seems far preferable to remove the solids as far as possible by good preliminary treatment, rather than to liquify the various substances in a septic tank, and thereby produce a very much stronger liquid.

The results obtained by septic tank treatment of dairy wastes are by no means sufficiently authenticated to warrant the adoption of this process in preference to precipitation.

It has been urged that precipitation involves a considerable amount of trouble and labour, but this need not be the case, and if it is possible to provide the supervision essential for the successful carrying on of a creamery, it is surely possible to provide the small amount of supervision needed for precipitation, especially if costly litigation arising from pollution of streams is thereby avoided.

It may be noted in passing that no tank process by itself will produce a liquid other than one which will subsequently putrefy, and to comply with the standard previously suggested the tank liquor must be subjected to biological filtration through a properly constructed percolating filter, the material of which is durable and of a suitable size. It should be observed that, unless due precautions are taken, a tank liquor derived from dairy wastes is apt to become extremely acid, particularly if it is an effluent from a septic tank, and this acid liquor will rapidly break down unsuitable filtering material. Good precipitation with the right precipitants minimises this acidity.

In certain cases dilution of the tank liquor may be advisable before it is filtered.

With regard to the type of filter, there is little doubt that the best form is that of the deep percolating filter, since first-class oxidising power is needed in a filter called upon to treat a liquid which absorbs large quantities of oxygen.

Distribution should be good in order to obtain the best results. In many districts peat is obtainable, and may be used as a distributor for certain types of filter; it requires, however, frequent attention and renewal when necessary if satisfactory results are looked for. The used peat possesses good manurial properties.

With regard to the treatment of dairy wastes upon land, it is desirable that there should be some form of preliminary treatment before the liquid is treated on the land, in order to remove solids which would otherwise tend to choke the pores of the soil.

A very excellent material is found to be fine peat arranged in the form of an embanked bed; the peat acts as a mechanical strainer, and after a certain time it requires removal and renewal.

Concerning the rate of treatment of dairy wastes upon land, much will depend upon the quality of the soil and subsoil; but with land of medium quality, from 3,000 to 4,000 gallons per acre per twenty-four hours of settled or strained liquid is probably a safe dose. Much, however, depends upon the nature of the intermittency of the irrigation.

Grass land is especially benefited by the careful application of dairy wastes.

Objection is often raised to the admission of dairy wastes direct to the sewers, and unquestionably, in the majority of cases, preliminary treatment should be given before discharge from the dairy premises, otherwise greasy solids are apt to coat the sewers and cause nuisance in hot weather.

No effort should be spared to bring the total amount of waste liquid to as small a volume as practicable before tank treatment, and it would seem that full use is not at present made of by-products, these being often regarded as wastes.

Separated milk is somewhat largely used on the Continent to form a constituent of certain insecticides, the milk causing the other chemicals to adhere slightly to the leaves and branches of shrubs and trees.

Casein has been used now for some time to make a substance resembling celluloid, and suitable for forming combs, knife handles, &c.

Proposed Reconstruction of Wearmouth Bridge.—The Sunderland Town Council have agreed to promote a Bill to authorise the corporation to reconstruct the Wearmouth Bridge, and conferring on the corporation the necessary powers with regard to carrying out the scheme.

International Engineering Congress.—A report having recently been circulated to the effect that the International Engineering Congress was to be abandoned, we are desired to state that this is not correct, and that the congress will be held in San Francisco as arranged, from September 20 to 25, 1915. A detailed circular of information regarding the publications of the congress has been prepared, and will be sent upon application to the Secretary, Foxcroft Building, San Francisco.

Roadside Hedges and Trees.—The highway surveyor to the Cuckfield Rural District Council, Mr. A. McArthur, in a report recently to that authority, stated that he had commenced his annual campaign on hedges and trees cutting, and hoped that those concerned would not fail to see that in giving this work the attention it deserved, the muddy road, the inevitable result of overgrown and neglected hedges and trees bordering on the highways, would disappear, and instead a clean and well-preserved road would ensue. The exclusion of light and air had a notoriously ill effect on the life of a road, and in the proportion that deterioration by this cause was arrested or removed, so was the cost of maintenance reduced, a matter of no little consideration where many miles of highways had to be maintained.

CRYSTAL PALACE OLD STUDENTS' SOCIETY.

ANNUAL GENERAL MEETING.

[illegible]

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[illegible]

[illegible] of how best to maintain the interest of the members in the society than how to fulfil the official duties [illegible] the programme.

The [illegible] tions at the present time is, of course, the great un- [illegible] across the English Channel, and happy indeed we must feel that the war is, so far, on the other side of the Channel, and that this may still be called the *English* Channel.

While our common bond of union is that wonderful structure first erected in Hyde Park as a Temple of [illegible] apply the [illegible] arts and sciences, yet does the [illegible] at the same time only too accurately [illegible] of peace among nations, and at [illegible] there cannot be a single member of our society or any surviving student of the Crystal Palace [illegible] School who is not vitally affected by the present struggle between the great nations of Europe. [illegible] whose interests are confined to peaceful arts are practically unemployed, or at least and our attention diverted from our normal occupations to a serious extent, while those who are associated with military organisations, whether themselves in the fighting line or engaged in some branch of military engineering, are earning something more glorious than money—the grateful appreciation of the British nation the wide world over.

I therefore need offer no excuse for devoting this [illegible] to the subject uppermost in all our minds, and as the main object of this society is to maintain [illegible] who have received their training at the Crystal Palace School of Engineering, I may first of all point out that the present emergency cannot fail to strengthen the bonds of sympathy normally existing between our members. However widely apart our lives and interests may now be placed, and unfamiliar as the present condition of national strife may be to us, I venture to claim that [illegible] who does not now feel a thrill of pride and enthusiasm at being a British subject. Thus, apart from training, profession or business, this war must bring us together in a new way, and awaken sympathies, perhaps dormant hitherto. Let me therefore appeal to every member who hears or reads this address to advise the hon. secretary as soon as possible what part (if any) he is taking in the war, or at least the extent to which he is affected by it. This will, I am sure, provide an interesting record which will greatly strengthen our mutual interest and mutual respect towards each other.

The Principal is also collecting the names of all old students who are engaged on active service, and we shall all feel proud to realise that so many Tower students have offered their services to their King and Country.

The next point which occurs to me is the very important, nay, vital, part which mechanical science or practical engineering now plays in warfare. The handling of men, the organisation of commissariat and physical services are no doubt of great importance still, but such matters are now overshadowed by the dominant necessity for up-to-date artillery, the design and defence of fortifications, mechanical transport, communication by telegraph and telephone, and aerial flight. Blood and muscle now work as auxiliaries of petrol and steel, and while blind, unreasoning discipline, combined with vast numbers of men, may be valuable items in time of war, we are daily having it brought home to us that the intelli- [illegible] constitutes the essential element of modern warfare. Here again, our common training at the Tower stands as a [illegible] bond of sympathy at the present time, for [illegible] not learn something about the intelligent use of mechanical [illegible] while there. We indeed were [illegible] opportunity. Moreover, [illegible] were not altogether [illegible] that we all received the elements of military training while at the school, [illegible] appeared at the time.

Let me not enlarge [illegible] war, so far as Great Britain is concerned, is a struggle in defence of all that we Englishmen hold dear, and, in particular, for freedom from domination by other nations. [illegible] called. Now, our national supremacy at home, on the seas, and in our many Colonies and Oversea Dominions, is founded essentially on our historic freedom (or "Liberte," as the French call it), and the [illegible] of the German Army (to say nothing of the German Navy), restrained so far from any concerted action, would involve the loss of that freedom, and the substitution of a disciplinary system [illegible] independent growth or development. This statement applies with peculiar force to the profession we are particularly interested in—engineering. Whatever and wherever our work may be, our professional advancement and success depend very largely upon "resourcefulness," personal independence and self-reliance in face of difficulties, and therefore we must all in a very peculiar degree be concerned in the issue of the war. Let us therefore unite our efforts and sympathies at the present time, and however humble or indirect our services may be, let us offer them with a free hand and in a generous spirit, to the end that once more Freedom may be victorious over Militarism, and British engineers be enabled to carry their special gifts into every part of the world, as they have done in the past.

In conclusion, let me send hearty greetings to our many members abroad, and wish that all may have a happy Christmas and a prosperous New Year, and should this brief reference to our national emergency awaken in any a renewed sense of motherhood and fellowship, may I ask him to be shown by a renewed and quickened interest in the Crystal Palace Old Students' Society!

We are pleased to recommend this [illegible] to all old students of the Crystal Palace School of Engineering who have not yet joined. Full particulars can be obtained on application to the hon. secretary, Mr. H. C. H. Shenton, 28 Victoria-street, S.W.

By-laws.—Mr. Roden Dixon, borough surveyor of Stratford-upon-Avon, would be glad to hear from surveyors of towns where by-laws with respect to new streets, drainage, buildings, &c., have been approved by the Local Government Board during the past few years.

Institute of Sanitary Engineers.—On Wednesday, January 6th, at Caxton Hall, Westminster, Mr. A. P. I. Cotterell, M.INST.C.E., F.R.SAN.I., will deliver his inaugural address as president of this body. The chair will be taken at eight o'clock by the retiring president, Mr. J. D. Watson, M.INST.C.E., engineer to the Tame and Rea District Drainage Board.

Westhoughton's Water Tower.—A new water tower at Syndale was formally opened recently. The tower has been built to hold a tank with a capacity of 200,000 gallons, equal to one day's consumption of Westhoughton, and is constructed of steel plates from ⅜ in. thick to ½ in. thick. The tank is 40 ft. in diameter, and will contain a weight of water equal to 900 tons. At the floor level the elevation is 477 ft. above sea level, and the tank reaches to 542 ft.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

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* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

The Provision of a Municipal Water Service.*—(3).

By LEWIS MITCHELL, M.Inst.C.E., F.G.S., Waterworks Engineer, Bolton.

It is, however, when we come to the [illegible] principal source of supply, viz., [illegible] dependent upon the yield of drainage areas that the greatest engineering knowledge and skill are called into exercise in the selection of a suitable drainage area, the determination of the available yield of such drainage areas, the choosing of eligible sites for the storage reservoirs, and the construction of such reservoirs.

In regard to the drainage area or gathering ground, it is desirable that it should be at such an elevation as to command the district of supply by gravitation; in some cases this is not possible—as at Leicester and Rotherham, where the water is first collected in the reservoirs and then pumped to the required height. Peat-covered moors should, as far as possible, be avoided, because of the discoloration and humic acid [illegible] liability to plumbo-solvent ability. The water supplied to some towns—such as Kilmarnock and Tynemouth—is so tinted with peaty infusion as to resemble weak tea or even porter. So important is this consideration that the precaution should also be taken of removing all beds of peat within the area of the reservoir itself; from the Delph reservoir (now being completed for the corporation of Bolton) not less than 100,000 cub. yds. of peat have been taken out, and from the area to be covered by the Alwyn reservoir (Birkenhead) over 1,000,000 cub. yds. of peat have been so removed.

Above all it should be free from pollution, and removed as far as possible from contaminating agencies. With the increase of population and the growing demands for wholesome water, together with the raising of the standard of purity insisted upon, many of our large towns and centres of population have gone long distances to tap such sources of supply, involving considerable expense, rather than continue to have recourse to the use of a more convenient and accessible but doubtful supply. Thus Manchester has gone to Thirlmere (a distance of 96 miles); Glasgow to Loch Katrine; Liverpool to Vyrnwy (66 miles); Birmingham to the Elan Valley (80 miles); Leicester, Nottingham, Derby and Sheffield to the Peak District; Bradford to the Nidd Valley; Edinburgh to the Talla; Birkenhead to the Alwyn (Mid Wales); and Fylde Water Board to the Hodder (a source suggested for Bolton). London, however, still takes the bulk of its supply from the rivers Thames, Lee and New River, whose drainage areas above the intakes are admittedly polluted, although as long ago as 1874 the Rivers Pollution Commissioners in their report on the "Domestic Water Supply of Great Britain" recommend "that the Thames should, as early as possible, be abandoned as a source of water for domestic use, and that the sanction of your Majesty's Government be in future withheld from all schemes involving the expenditure of more capital for the supply of Thames water to London"; further, "that the Lee should also be abandoned as a source of potable water," but "this measure is less urgent than the relinquishment of Thames water." Moreover, in 1895 the Water Committee of the London County Council prepared a scheme for supplying water from a series of reservoirs to be constructed in the uncontaminated drainage areas of the Wye, Usk and Towy, in the counties of Radnor, Brecknock, Carmarthen and Montgomery, from which 415,000,000 gallons per day could be obtained; but they are still content to drink water which is, on the authority of their medical expert adviser, "reasonably safe."

If the drainage area is not considerably remote from inhabited centres, it is difficult, and becoming increasingly so, even when absolute control has been secured by purchasing the lands, to entirely prevent pollution. In such a case it is essential, since cultivation of the land and ordinary farming operations are incompatible with the preservation of the purity of the water, to clear off the farms from the catchment area, remove all human habitations therefrom, and prevent, or reduce as far as practicable, the incursion of the public over it. But since it is also desirable to encourage farming operations and cultivation of the soil, which are already too much neglected in this country, and considering that facilities should be given to the toiling masses of our towns to become more intimately acquainted with the beauties of the surrounding country and to breathe the purer and health-giving air of the hills and moors, so that every public right of access thereto should be preserved, and having regard to the multifarious interests, private and public, which are usually associated with or arise from such an area, it is generally preferable, under all circumstances, to impound water supply from a [illegible] uncontaminated and comparatively unrestricted area, notwithstanding the extra cost involved in connection with the longer aqueduct necessary. It has to be admitted that in the past too great discretion has not always been exercised in selecting gathering grounds, the quantity available rather than the quality of the water, and the proximity of the source to the district of supply permitting it to be provided at a comparatively low rate being the principal considerations. In view, however, of the bearing which these remarks might be taken to have upon any water undertaking in particular, it should be pointed out that Parliament would not readily grant to an authority powers sought by them under a Bill for the construction of waterworks and the appropriation of gathering grounds, the waters from which did not naturally flow towards that authority's town or district of supply, until it had already exhausted, or within a reasonable time would fully utilise, all available sources near at hand.

COMPENSATION WATER.

Having fixed upon a suitable gathering ground above the site of an intended reservoir, and having determined the quantity of water to be provided for the town, and the available yield or run-off which may be expected, having regard to the rainfall and extent of the catchment area, it is necessary to take into account in the calculations another factor, owing to the compensation water which has to be afforded to the streams below the site of the intended works or point of abstraction. On this matter Parliament is most insistent, and provides that, before application is made for a Bill whereby it is proposed to abstract water from a stream, notice in writing must be given by its promoters to the owners or occupiers of all mills and manufactories or other works using the waters of such stream or river of which it is tributary for a distance of 20 miles below the point at which it is intended to abstract the water, or down to a point on such river where its waters are navigable.

When Parliament authorises a corporation (or undertakers) to take water from a watershed, it is the invariable practice to provide for compensation for injury likely to be caused by the abstraction of water which would otherwise find its way into the streams or rivers fed by the watershed. This compensation may be in kind, or, especially if there are few mill-owners, in money, or in both, and in rare instances the injury likely to occur to particular works on a stream may be so great that a clause may be inserted requiring the water authority to purchase the mills or works of petitioners if they can prove to the satisfaction of an arbitrator that the business cannot be satisfactorily carried on by reason of the construction or maintenance of the works.

The measure of water compensation given by Parliament is usually one-third of the mean available rainfall of three consecutive dry years, and provision is generally made for the regular, equal and continuous supply of this water to the streams and rivers during the twenty-four hours, or twelve hours of each day. In exceptional cases a less amount has been allowed. Thus, in the great schemes of Thirlmere for Manchester, and Elan and Caerwen Valleys for Birmingham, the compensation water given was calculated upon one-fourth instead of one-third of the mean available rainfall, and in the case of Vyrnwy for Liverpool it is even somewhat less. The statutory obligations placed upon Bolton Corporation in respect to the compensation waters from their Wayoh and Belmont reservoirs are in some respects unique, inasmuch as the quantity is not less than 37 per cent in excess of the water available for the town (an inequity which is not perpetuated by the Bolton Corporation Act, 1905), and also by the fact that part of the compensa-

* Lecture delivered recently at Bolton.

[illegible] water in an Wayoh reservoir must be filtered—conditions which are not only singular, but glaringly [illegible]. In some cases a corporation [illegible] takes to [illegible] the compensation water out of their own reservoirs, or dedicates to the millowners a separate drainage area [illegible] in extent of that proportion to be appropriated for the town supply, on which they agree to construct a reservoir of a definite capacity to be [illegible] under the control of the millowners and riparian proprietors.

The latter is unquestionably the more equitable, as it releases the corporation from the obligation to send down the stream or river a fixed quantity at all times, whether it may be required or not, and it places the management of the compensation reservoir in the hands of millowners, who can control and regulate the discharge therefrom to their own satisfaction, while both the corporation and the millowners stand upon an equal footing as regards the fluctuations of the seasons, and the conditions arising from prolonged droughts. The effect of the last-mentioned incidence will be apparent when it is pointed out that under the former arrangement a corporation is, as a rule, placed under a considerable penalty in case of failure, neglect or default to discharge the full statutory [illegible] of compensation water. Under the Act of 1905 the Bolton Corporation will be liable to a penalty not exceeding £25 per day in the event of the compensation waters from either the Delph, Eagley, Belmont, Wayoh or Broadhead reservoirs being less than those stipulated and will further be liable to make compensation for any loss, damage or injury sustained by any millowner or other person interested in any case where such loss, damage or injury arises from an avoidable cause or the neglect of the corporation; whereas, in the event of a drought, no responsibility whatever devolves upon them now in regard to the amount sent from their Rumworth, Wayoh and Belmont compensation reservoirs.

ACT OF PARLIAMENT.

The next step to be taken by a water authority or company is to secure powers to take the water, construct works, and acquire lands and easements by promoting a Bill in Parliament and obtaining an Act. In modern water Acts the following are among the usual clauses inserted:

(1) Power to make arrangements with owners.
(2) Incorporation of Acts (the Waterworks Clauses Acts, 1847 and 1863, and the Lands Clauses Acts).
(3) Power to make works.
(4) Limits of deviation.
(5) Power to take water.
(6) As to compensation water.
(7) Power to hold lands for protection of waterworks.
(8) By-laws for preventing pollution of water.
(9) Corporation not bound to supply several houses by one pipe.
(10) By-laws for preventing waste of water.
(11) Supply to houses partly used for trade.

The procedure taken in obtaining a Private Act is briefly as follows: A plan showing the intended works and lands to be acquired, together with a book of reference thereto, is deposited for public inspection at the office of the Clerk of the Peace for the county in which the works are proposed to be made, and in the Private Bill Office of the House of Commons on or before November 30th immediately preceding the application for the Bill; notice giving a description of the proposed works and their locality is published in the months of October and November in the *London Gazette* (the *Edinburgh Gazette* for Scotland, and the *Dublin Gazette* for Ireland), and once in each of two successive weeks, with an interval of not less than six clear days, in some newspaper of the county in which the principal office of the corporation is situate. In compliance with the Borough Funds Act of 1903 it is essential that the Bill be submitted to a public meeting of electors, notice of which must be given by placards and advertisements in two successive weeks. At this meeting the mayor presides, and either he or an officer of the council gives such explanation of the Bill as he considers expedient. The decision of the meeting expressed by a single resolution in favour of the whole Bill, or by separate resolution in favour of any part or parts, is final, unless a poll is demanded by not fewer than 100 electors or one-twentieth of electors, whichever may be the lesser. If, however, the decision of the meeting is against the resolution, the council may require a poll, which would be conducted in accordance with the regulations of the Local Government Board. A copy of the Bill is deposited before December 18th at the office of His Majesty's Treasury and at the General Post Office; the office of the Secretary of State for the Home Department, and at the Local Government Board; at the offices of the Board of Trade and the Board of Agriculture and Fisheries; and if any streets or roads are to be interfered with in the laying of conduits, at the office of the Road Authority. On or before December 31st there are deposited at the Private Bill Office and office of the Board of Trade or Local Government Board copies of the estimates of expenditure in the intended works, together with a statement giving (*a*) area of the district, (*b*) population at last census, (*c*) rateable and assessable value, (*d*) rates made in the district during the last preceding financial year, (*e*) the sum of the balances of outstanding loans contracted by the local authority. The petitions for Private Bills are examined, and if the examiner considers the Standing Orders have been complied with, he endorses them and reports accordingly to the House. The chairman of the Committee of Ways and Means or the counsel to Mr. Speaker, on or before January 28th, seeks a conference with the chairman of Committee of the House of Lords or with his counsel, and they determine in which House of Parliament the respective Private Bills shall be considered. Referees, who are, of course, Members of the House, are appointed by Mr. Speaker, and they decide upon all petitions against Private Bills or Provisional Orders as to the rights of the petitioners to be heard upon such petitions—[illegible] as be then *locus standi*. At the commencement of every Session a Committee of Selection, consisting of eleven members, of which three constitute a quorum, is appointed, before whom copies of all Private Bills are laid by the parties promoting the same. They form the Bills into groups, fix the time for holding the first sitting of every committee, and refer every opposed Private Bill, or group of such Bills, to a chairman or referee and three members. Before this committee evidence is led by the witnesses for the promoters, and afterwards in opposed Bills by witnesses for petitioners against the Bill who have been given a *locus*. During the hearing of the case clauses are not infrequently amended or entirely withdrawn, and provisions are inserted for the protection of parties whose interests might, by the operations of the Act, be prejudicially affected, and after full consideration has been given to the representations made by all parties the preamble is proved, the Bill is promoted from the House in which it has been first presented to the other House, and when the Committees of both Houses, aided by expert witnesses and counsel, have shorn it of all inequalities and given it their approval, it receives the Royal Assent and becomes an Act of Parliament.

LANDS TO BE ACQUIRED.

Armed with the powers of an Act of Parliament the corporation acquire, by agreement when they can, or compulsorily and by the process of arbitration, the lands upon which the works are to be constructed, and lease or acquire those forming the watershed so as to give them absolute powers of control. Notices to treat, showing by plan the lands or easements to be taken, with a description thereof, are first served upon the owners and occupiers, and in due course claims are submitted which, if not accepted, are referred to arbitration. As a rule the lands so required are always specially valuable, and suddenly assume an enhanced value from the unwilling seller's point of view, and much ingenuity has been evinced by the variety and comprehensiveness of the claims made, which not unusually are as modest as that propounded by the late president of a republic, "for moral and intellectual damages." One of these is known as "special adaptability," and in the well-known case of *Ossalinsky (Countess) v. Corporation of Manchester*, raised in connection with the extension of the water area of Thirlmere, where a portion of the lands submerged belonged to Countess Ossalinsky, the principle was established that, in estimating the value of land and easements to be acquired by a corporation or company for the construction of a reservoir, the natural and peculiar adaptability for the construction of a reservoir of the lands in question is a fit and proper matter for consideration as an element in the value thereof in the assessment of compensation. The same point was raised and decided in the case of an arbitration between Gough and Aspatria, Silloth and District Joint Water Board. Such a claim ought not, however, in equity to be allowed, at least until the site has been proved to be

specially adapted, in a number of instances where the claim has been made it has afterwards been found necessary to abandon the site for geological considerations.

CAPACITY OF RESERVOIRS.

In order to ensure a continuous supply of water to the town, or to provide the statutory amount of compensation water to the millowners, or both combined, it is necessary, with a limited drainage area, to construct reservoirs to impound the floods which at certain seasons flow off in volumes too large for the demands, and pay out the required amount during dry seasons or when the flow in the streams falls below such requirements. The function of a reservoir being to equalise the fluctuations of the yield of a watershed due to the ever-changing seasons, or to impound water in times of plenty, and dole it out in seasons of deficiency. The primary question as to the capacity of the intended reservoir must now be settled, and obviously its determination is dependent upon two circumstances—the extent of the drainage area and the climatic conditions. In this country it may be taken as a general rule that where the rainfall is least there the greatest amount of storage is required, and in hilly districts, especially in Wales and on the western side of England and Scotland, where the rainfall is greatest, the storage accommodation need not be so large as in the case of reservoirs built on the eastern and southern sides of this Island. In this district 180 days' supply is ample, but in certain places 250 and even 300 days' supply may be required.

RESERVOIRS.

In the selection of the site for a reservoir there are three principal considerations—the elevation, the configuration of the ground, and the foundations—the ideal site being at a sufficient altitude to ensure the gravitation of the water to the district of supply, and a sufficient pressure in the distributing mains at every point therein, and such that a large basin can be enclosed by embanking across a narrow, impervious defile or gorge.

Before finally deciding upon a site and the type of structure to be adopted, it is essential to prove the foundation as far as possible. Things are not always what they seem, and a site which on the surface may appear to be ideal may, on further investigation, prove to be altogether geologically unsuitable. It might not be uninteresting, if time permitted, to refer at some length to cases of disappointment and failure in reservoir construction arising from neglect to thoroughly investigate the foundations before proceeding with the works. The cases are so numerous in which it has been found necessary to excavate the puddle trench to depths greatly in excess of what had been anticipated or even to abandon the site after considerable expense had been incurred. Mr. Bateman, in his "History of the Manchester Waterworks," tells us that, in the case of the Woodhead reservoir (Longdendale Valley), the excavations disclosed a foundation so different from what had been expected that the first site selected had to be abandoned. At the Yarrow reservoir (Rivington) similar conditions led to the sinking of the puddle trench to a depth of 168 ft. below the surface of the ground; and so with Cant Clough (Burnley), sunk to a depth of over 200 ft.; Glengavel reservoir (Mid Lanarkshire); Dunton reservoir (Kilmarnock; Glenquoich reservoir (Dunfermline) for the naval base at Rosyth, on the Forth; and others. Many selected sites have been discarded before the commencement of the works on the evidence of borings or trial pits that a sound bottom could not be found within a practicable depth—*e.g.*, that for the intended reservoir in the Colsterdale Valley (Leeds), for the construction of which Parliamentary powers had been obtained, and which, on the evidence of several leading geologists, was an excellent site, was given up as being altogether unsuitable; and there are others which might be mentioned in respect of which large sums had been paid for the acquisition of the sites because of their presumed special adaptability.

The character of the foundation as well as that of the material available in the vicinity of the site are the chief factors to be taken into account in determining the kind of embankment which can most advantageously be adopted. Embankments are of two kinds—masonry and earthwork. While the earthen embankment is the older form (some of those built by the ancient Egyptians and Indians still remain), and fewer failures of this type have resulted, there are circumstances which leave an engineer no option in deciding which is the more suitable, because he is bound to utilise the materials which Nature has provided in the locality in which the proposed work is to be constructed. In clay and earth, for example, and there is an abundance of rock, or if the hillsides are so immense that it is necessary, in providing for the escape of flood waters, to utilise the whole length of the dam as a waste-weir, or if the depth of the valley is greater than the height to which it is practicable or desirable to build an embankment of earthwork, or if the climate is extremely variable, and at times so hot that earth embankments built on a large scale would be liable to be seriously affected by the formation of deep cracks due to excessive evaporation, then a masonry dam is unquestionably the proper type to adopt.

There are excellent examples of both types in this country, such as the masonry dams of Burrator (Plymouth), Vyrnwy (Liverpool), Rhayader (Birmingham), Gouthwaite and Angram, in the Nidd Valley (Bradford), and the earthen embankments such as Woodhead reservoir (Manchester), Scout Moor and Ogden (Bury), Entwistle, Wayoh and Delph reservoirs (Bolton).

A detailed description of the method of constructing reservoir embankments is here quite impossible, but, briefly, a large earthen embankment may be described as consisting, in general, of a bank of earth formed across a valley to a height of not less than 5 ft. above top-water level, with a top width of at least 12 ft., and sloped downwards from the top on each face sufficiently below the natural angle of repose of the material forming it as to prevent slipping. The inner face, which is exposed to the action of waves, is protected by stone pitching. The watertightness of the embankment, on which the success of the work depends, is secured by a wall of retentive clay puddle which is carried from a solid stratum of rock, indurated shale, or boulder clay from below the base of the embankment right up through the centre of the bank to above the top water level. In some examples the trench is wholly filled with concrete, or, as to Delph reservoir works, the lower portion, which is narrower than the upper portion, is filled with concrete, and the upper section and wall are formed of impermeable clay. During the construction of the embankment the waters of the streams are carried off by means of a tunnel of sufficient area to cope with the largest expected flood, and which is ultimately utilised for discharging compensation water, and for receiving the conduit for conveying water to the town. From a tower the water is drawn off from the reservoir through valves fixed therein at different levels, so that the upper and most clarified waters may always be taken for consumption. An overflow or waste weir, wide enough to deliver the full run-off from the drainage area without endangering the stability of the embankment, is provided, and a bywash channel for excluding the first rush of flood waters from the reservoir itself is considered essential in all modern works.

In masonry we have a more reliable material than earthwork, and one in which the strains and pressures can be brought within the power of calculation and exact mathematical demonstration. There can be no doubt that if the depth of water to be retained exceeds 100 ft., a masonry dam is far safer, though probably more costly than an earthen embankment. It is, however, an essential condition of stability that the foundation be on a continuous impermeable rock; it would obviously be imprudent to attempt to construct a rigid masonry dam on a clay or gravel foundation, or upon one partly on rock and partly on soft shale; to do so would be to court disaster.

(To be concluded.)

Widening of Putney Bridge.—The Improvements Committee of the London County Council recommend that the preliminary works in connection with the proposed widening of Putney Bridge be undertaken at an expenditure of £1,500. The total cost of the complete improvement is estimated at £230,000.

Birmingham Sanitary Engineers.—A meeting of the Birmingham and Midland Centres of the Institute of Sanitary Engineers was held at the Exchange Restaurant recently. Mr. W. E. Farrer presided, and introduced Mr. C. E. Shackle, the new president, who thereupon took the chair. Mr. Shackle, who is the local resident engineer of the Great Western Railway, read a paper on "Timbering in Tunnels and Trenches."

CORRESPONDENCE.

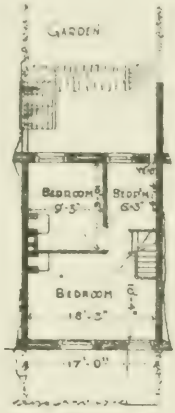
Sir, though I would persuade, I'll not constrain
Each man's opinion freely is his own
Concerning anything, or anybody
—MASSINGER. "The Fatal Dowry," Act II., 2

HOUSING OF THE WORKING CLASSES.

To the Editor of THE SURVEYOR.

SIR,—I have perused your editorial comments on [illegible] "Housing of the Working Classes."

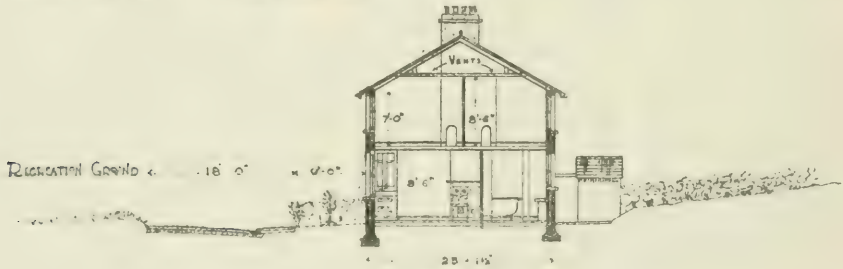
Ground Floor Plan.



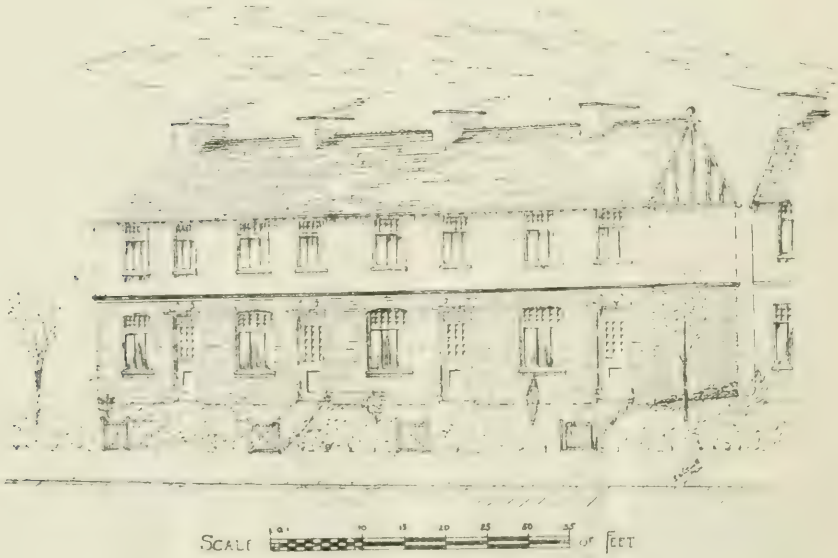
First Floor Plan.

In the first place, with regard to the closing of [illegible] the application of which you state [illegible] I do not [illegible] any authority to have attempted in [illegible] date to carry out the [illegible] of a generation would have been [illegible] consequences so much as [illegible] council has attempted. Neither in the period [illegible] has any authority in any rapidly growing [illegible] done so much as to provide for the new requirements, much less to fully provide for the substitution of the old; therefore my contention holds good, that the shortage in a large number of districts has gradually become more acute and has done much to prolong the life of slumdom.

With regard to your disagreement "that good, serviceable, attractive houses may be built at a rental quite within the reach of those people for whom they are intended," and to your subsequent opinion, may I point out that my remarks cannot be interpreted as indicating too broad a generalisation? In my introductory remarks at the meeting of the Association of Municipal Engineers I emphasised the fact that possibly many authorities were prevented from erecting cottages for labourers to let at rentals so high even as 4s. 9d. and 5s. 6d. by reason of a prevailing low wage, and that if such were the case the question became an economic one; in such case the health or the welfare of the tenants should not be sacrificed by the reduction of those necessary adjuncts to proper housing in order to bolster up and thus help to perpetuate a faulty economic system. What I desired by the reading of my paper was to emphasise the need of local authorities aiming at a much higher standard when undertaking housing schemes, and to indicate that many



Section.



ABERSYCHAN WORKING-CLASS DWELLINGS.

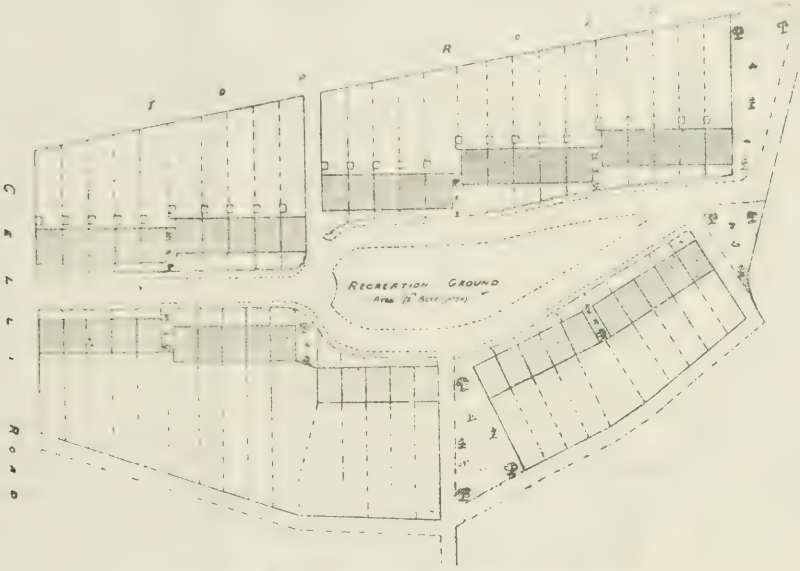
and shall be obliged if you will allow me to make a few remarks thereon.

of the ideas of experts [illegible] realised, and in some instances were [illegible] more economically attractive than by following the obsolete types, [illegible] expenditure of profit-seeking speculators. As I said later, though at Abersychan not quite all the desired features had been secured, some idea of what has been done may be gathered from the accompanying set of plans, comprising (1) block plan of one scheme, (2) plan of house, and (3) the perspective of one block in another scheme. In the schemes for 200 houses now in course of preparation, I hoped to realise my ideals to aim at still better results. That something has been effected in the right direction your readers may form some opinion from the plans, and that some successful results have been attained may be gathered from the fact that at the end of the last financial year not one penny of rent was outstanding.

To sum up in a few words, the house which can be erected to let at 5s. 6d. per week, or at any other figure, in any district, may be just as economically provided by following the outlines I have given as by laboriously copying the monotonous structures and environments of the past generations.—Yours, &c.,

E. Whitwell.

Abersychan, Mon.
December 15, 1914.



Abersychan Working-class Dwellings—Block Plan.

[Mr. Whitwell is to be congratulated upon his scheme, which has proved to be such a great success, from the point of view both of design and finance. As regards the effect of the closing order sections of the Act of 1909, a perusal of the editorial note in our issue of December 11th and of the above letter shows that we are really in agreement. Regarding the possibility of municipal building of cottages to let at economic rents, Mr. Whitwell has succeeded where many others have failed, a fact which he points out was noted in the earlier part of his paper. Our thanks are due to him for the drawings accompanying his letter.—Ed.]

CONCRETE ROADS.

To the Editor of The Surveyor.

Sir,—Adverting to the letter from the worthy president of the Institution of Municipal Engineers which appears in your current issue, I am quite aware that some sections of reinforced-concrete road surfaces have been laid in the ancient city on the Dee, and do not think it is claimed that those which are at present being laid in Kent are the "Alpha and Omega."

The reason it was specified for wet sand to be laid on the surface was because it was originally anticipated that the work would be done in warm, dry weather, and specially slow-setting cement is being used.

If Mr. Jones will look at your issue of the 4th inst. he will see that the surface dressing of sections Nos. 2, 3 and 4 is to consist of tar and ¼-in. limestone chippings, and not 1¼-in. chippings, but that the latter was a misprint; also that the surface of section 1 is not to be treated or dressed.—Yours, &c.,

H. T. Chapman,
County Surveyor.

Maidstone.
December 19, 1914.

To the Editor of The Surveyor.

Sir,—With reference to the experimental sections of concrete roads which are now being laid down in various parts of the country, might I say that concrete roads have been in use in the Edinburgh and Leith districts for at least thirty years?

They have been laid in various ways, some being finished with a rough surface composed of 2-in. road metal and cement, while others have had a smooth finishing coat of ¼-in. granite and cement.

The rough-finished concrete is open to the objection that stones here and there are knocked out by the action of the horses' hoofs, and the resulting holes soon become enlarged unless they are at once repaired. The smooth-finished cement wears much better, but does not afford such a good foothold for horses, though it is better than asphalt in that respect.

Concrete roads cannot be laid without joints, and herein lies their weakness. In course of time the edges of the joints become frayed owing to the action of the wheels and the horses' hoofs, and once the "skin" is broken the joint rapidly enlarges. To satisfactorily repair a concrete road necessitates keeping the traffic off for a week or ten days in order to allow the cement to harden properly. This is a serious drawback on a busy road. For side streets, with light traffic, concrete makes an excellent road, which is clean, dustless and comparatively noiseless. I have no experience of reinforced-concrete roads, as I believe reinforcement is unnecessary for light traffic; but concrete roads of any kind will, I believe, be found unsuitable for heavy traffic. In city roads, where the surface is being continually broken up to allow of the laying or repair of underground pipes, reinforcement will, I feel sure, be found to be unsatisfactory.—Yours, &c.,

J. R. Findlay,
Burgh Surveyor and Master of Works.

Leith.
December 22, 1914.

Institution of Municipal Engineers.

MEETING AT MANCHESTER AND SALFORD.

On Saturday, the 12th inst., a meeting of the Institution of Municipal Engineers was held at Manchester and Salford. Members assembled at the Midland Hotel, Manchester, and proceeded in a body to the Salford Corporation flag-making and cleansing works. Some seventy-five members, including their wives and families, were present, among them were Alderman A. Wilson (mayor, Salford Corporation), Alderman J. Hulton (chairman, Cleansing Committee, Salford Corporation), Councillors G. Billington (chairman, Electricity Committee, Salford Corporation), W. M. Beesley (Salford), S. Hollins (Salford), T. Higson (Salford), R. Hopwood (Salford), R. Williamson (Salford), Mr. W. H. Hamblett (superintendent, lighting and cleansing department, Salford), Alderman R. Grundy (mayor, Heywood Corporation), Alderman J. Hoyle (chairman, Health Committee, Heywood Corporation), Alderman F. P. Dixon (Carlisle), Messrs. W. Matthews Jones (city surveyor, Chester, president of the Institution), Horace Bent (London, past-president), A. R. Bleazard (Clitheroe, vice-president), Arthur Bowes (Newton-in-Makerfield, vice-president), W. Finch (Cumberland County, vice-president), John Robinson (Darlington, vice-president), G. W. Battye (South Cleveland), J. Murray (Kilmarnock), J. J. Davies (Little Hulton), J. Sedden (Colne Valley), F. C. Martin (Blackburn), J. T. Arnold (Blackburn), W. B. Butler (Cumberland County), Chas. Hinchliffe (Slaithwaite), G. H. Hopkinson (Chorley), J. W. Sunderland (Norden), F. W. Platt (Salford), J. S. Garment (Chorley), J. W. Glover (Heywood), L. Walker (Stretford), A. Elder (Oldham), J. W. Wiles (Manchester), J. A. Wright (Great Crosby), A. Dempsey (Eccles), S. R. Aspinall (Manchester), and W. Briggs (Stockport), members; J. A. Robertson (Salford), H. J. Wilcox (Eccles), G. Dyson (Stocksbridge), John Park (Kirklinton), R. Stockbridge (Kirklinton), E. Johnson (Little Lever), J. Morris (Salford), G. Morris (Eccles), N. Clarke (Manchester, J. Blewitt (Urmston), S. T. Dunn (Eccles), and E. Ryder (Manchester), visitors; and R. J. Dickson, Hyde (district secretary, North Western District), and B. Wyand (secretary of the institution).

At the flag-making works the members were received by Alderman Hulton, chairman of the Cleansing and Lighting Committee of the corporation, who said that he thought they would see something good in the flag plant, and hoped it would be interesting and educational to them. He could not do more than give them a cordial welcome to all that they would see; but he would ask Mr. Hamblett, their superintendent of the Cleansing Department, to explain the [illegible] that [illegible] with the mechanical parts of the works, and Mr. Platt (who was one of the institution members) with the building portion. He was certain that both gentlemen would explain matters perfectly.

Mr. W. H. Hamblett, superintendent of the Salford cleansing and lighting department, said it would afford him great pleasure to show members of the institution the flag-making installation they were now visiting. For that building, the engine-house, and all the buildings necessary to the making and working of the hydraulic machinery the plans were prepared by their building surveyor, Mr. Platt. That gentleman [illegible] the committee, and it was pleasing to know that the works were completed at a figure below the approximate estimate which had been prepared on the guidance of the committee and the council. The mechanical portions of the works were arranged for and the designs carried out by their humble servant. He did not wish to take up their time by a description of the machinery, but thought a practical demonstration would serve a more useful purpose than anything he could say on the matter.

The following [illegible] of the flag-making works:—

PARTICULARS OF THE SALFORD CORPORATION FLAG-MAKING WORKS.

BUILDING SECTION.

At the February council meeting, 1911, the council gave authority, on the recommendation of the Lighting and Cleansing Committee, [illegible] to be made to the Local Government Board to borrow money for the erection of the [illegible] building and disinfecting plant at Agecroft, and on February 24th the Building and Bridges Committee acceded to the request of the Lighting and Cleansing Committee to allow the building surveyor, Mr. F. W. Platt, to prepare the plans, &c., of the buildings.

In preparing the plans, consideration had to be given to the type of foundation, and the building surveyor recommended that reinforced concrete should be largely used, both in the foundation floors and in the retaining wall. The plans were then put in hand, and on May 8, 1911, they were approved by the Swinton and Pendlebury District Council. The building surveyor then took out the quantities. The tenders were advertised for; that of Messrs. Gerrard's was the lowest, and was accepted by the council at the December meeting, 1911.

Application was made to the Local Government Board in the following month, but the consent of the Local Government Board to proceed with the work was not received until July 3, 1912. The builders commenced their work—namely, the erection of five buildings and the boundary wall—on August 29, 1912.

The contract comprised the erection of seven buildings, a boundary wall, and a retaining wall. All the walls rest upon reinforced-concrete foundations, and all the floors are of reinforced concrete. These buildings contain the first reinforced-concrete floors constructed in any building owned by the corporation. At the mixing-house the suspended reinforced floor has a span of 27 ft. without an intermediate column, so that the press can freely work. The retaining wall near the boiler-house and the boiler-house have been built by the committee's own workmen. The wall is the first reinforced counterfort concrete retaining wall that has been erected by the corporation. Had it been constructed in ordinary concrete it would have needed to be at least three times its present thickness. It is strong enough to carry a motor lorry up to 30 tons in weight on four wheels—a great deal heavier than anything which will pass up the present roads.

By the culverting of a watercourse 400 yds. of land have been rendered available for the use of the depot, as well as giving access to a part upon which the drying shed has been erected. All the building work has been carried out under the direct supervision of the building surveyor.

ENGINEERING SECTION.

The machinery erected in the various buildings is as follows:—

In Block 4 a clinker crusher with elevators to raise the crushed clinker to a perforated-iron screen, which screens the crushed clinker into three different sizes. The finest grade of clinkers is passed through rollers and ground to a sufficient fineness for the purpose of slab making, the other screened clinkers being of such sizes as can be put to economical uses in the borough.

In Block 2 the fine clinker is passed over a metallic separator, and raised from the point of discharging the clinker up to a mixing pan into which there is delivered the proportion of cement necessary for the making of concrete slabs. Both the clinker and cement supply are automatic, and discharge into the mixing pan in the proportions actually required. The mixture of clinker and cement having been completed, it is discharged through an aperture in the wall into a press-house (Block 1), where the three-mould press is situated.

The discharge mixture of cement and clinker is conveyed by a trolley from the point of discharge to the mould press. The press, which is worked by hydraulic power, is under complete control by valves, manipulated by a man standing at the side of the press. The working power of the press, mixers, crushers, screen and elevator is provided for as follows:—

The clinker crusher, elevator, screen, and crushing rolls in Block 4 are worked by a horizontal steam engine in building adjoining, the steam being provided direct from the boiler fixed in connection with the refuse destructor.

The power for driving the metallic separator in Block 2, also elevator and mixer, is provided direct from the engine and dynamo in large engine-house

to a motor in Block 3, which will also drive the pumps required for the water supply in the accumulator, which is fixed in Block 3. The upper portion of the buildings in Blocks 1 and 2 are used as store rooms for granite and cement. The granite is mixed with the cement for the purpose of treating a granite coat of 1 in. to the clinker slabs, and necessary tools are provided for the easy delivery of both granite and cement from the upper to the lower floor.

The motive power driving the dynamos is a high-speed vertical compound engine of 60 h.p. coupled to a Lancashire dynamo of the same power, and from these is obtained all the power necessary for working the pumps, mixer, metallic separator, elevator and accumulator; also the electric power necessary for lighting the depot, offices and stables. The steam for the engine is derived from the Lancashire boiler attached to the refuse destructor.

The following are particulars of the slabs: Granite face, ¾ in. thick; clinker, 1¾ in. thick; total thickness, 2½ in. thick; mixture, 3 to 1; pressure on slabs, 2,240 lb. per square inch.

The corporation electricity works in Frederick-street Pendleton were next visited, and the members were received by the chairman of the committee, Councillor G. Billington and Mr. J. A. Robertson, the electrical engineer.

Here Mr. Robertson particularly described a new 5000-kw. steam turbo-generator which the corporation have recently installed. As the details of this installation were made public only a week ago, it is not necessary to go into them. It is sufficient to say that the visitors found this great engine working smoothly and satisfactorily.

RECEPTION AT SALFORD TOWN HALL.

After the inspection of the different works the members were accorded a civic reception at the Salford Town Hall by the mayor (Alderman A. Worsley). The members having signed his Worship's visiting book, the party adjourned for tea in the town hall canteen. Alderman J. Hulton presided, and at the commencement of the post-prandial proceedings the PRESIDENT said there was one sorrowful matter that he would like to bring before the members before they commenced the social programme. The members of the Northern District, in particular, were well acquainted with Mr. Pegge, the first president of the institution. Some six or eight months ago Mr. Pegge entered into matrimony, and it was with deep regret that they now learned that his wife had passed away. Were it not for this trouble Mr. Pegge would have been with them, and he thought they could not do less than send a note of condolence to him. Therefore he moved, with great regret, that such a note be sent.

Mr. H. BOOT (the ex-president), with a similar expression of sorrow, seconded the motion. Mr. Pegge, as their first president, had done much valuable work for the institution, and the members deeply sympathised with him in his bereavement.

The vote was carried in silence.

The CHAIRMAN said this was rather a melancholy commencement of their festive gathering, but he fully sympathised with their organisation in their sorrow at so great a bereavement in the family of their distinguished member.

Following the loyal toasts, Councillor DELVES proposed the health of the president, at the same time expressing wonder that such a task should have devolved upon him at a gathering of that kind. Perhaps it was because they were all brothers—were all engaged in trying to do what they could for the benefit of the communities in which they lived. He thought there was no greater work in which civil engineers or municipal engineers could be engaged than that which they were doing in the lighting, cleansing, tramways, gas, water and other undertakings of our various municipalities. He was glad to know that throughout the country—throughout municipal England—the death-rate of the various centres of the population was gradually, but surely, decreasing. It was an evidence of the grand and good work in which municipal engineers were engaged. He knew they did not want long speeches, but he wished both the members of this institution and all civil engineers to know that the members of the various councils of the country were largely dependent on the advice they gave with respect to adopting schemes and measures which would tend to the betterment of the various boroughs and cities in which they worked. The country owed a deep debt of gratitude to its municipal engineers, and therefore the borough of Salford was pleased to give an enthusiastic welcome to them. He asked them to drink to the president—Mr. Matthew Jones, and the Institution of Municipal Engineers.

The PRESIDENT said he could not refrain from saying how much and how deeply they felt the kindness extended to them on their thinking Mr. Delves, for the very kind expressions he had used in regard to their profession. The Institution of Municipal Engineers was now in its sixth year, and they had a membership including members and associates—of about 900. Last year, when their friend Mr. Boot was president, they had at their annual gathering in London the Lord Mayor and Lady Mayoress of London, and, moreover, eighteen other mayors and mayoresses attended the function. On that occasion the Lord Mayor expressed the view that in the very near future no gentleman would be appointed to hold an official position under a council unless he was a member of an institution such as theirs. The members of the institution met to benefit each other, and to-day he thought it would be agreed that what they had seen at the works they had visited had taught every one of them something that they could take back to their own cities, boroughs or urban district councils, and bring to their notice with advantage. They could not only bring them to the notice of their own respective councils, but, if possible, try to improve on what they had seen, or get them to adopt something on similar lines. They did not always meet to receive politic addresses of this kind, but they did meet to consider the best things they could do for the benefit of the councils which they represented. He again thanked Mr. Delves very sincerely for proposing the success of the institution, but before he sat down he had another duty to perform. This was to propose the health of his Worship the Mayor of Salford. He thought his Worship would be aware that borough surveyors generally were not what they in Cheshire called "possessed of the gift of the gab." They could not talk in public—it was not their line. But if he got his Worship in his own office, talking on the business of a surveyor, he would guarantee to prove quite as capable at it as any member of a council. And he thought it was the duty of every member of that institution to make himself capable of talking on these occasions—in other words, thoroughly to understand his business and know what he was talking about. He should be able to discuss promptly and readily any matters that came before him, and give his judgment without any "humming and hawing"; in short, he ought to be in a position to say at once what was right or wrong, and advise his committee accordingly. They had seen at the Salford works two very large undertakings, and he was sure that the greatest credit was due to the officials who had been responsible—and were still responsible—for the running of these works. They had the control and management of many thousands of pounds' worth of building and machinery in their hands, and only capable men such as they had got in their corporation could run such great works. He thanked his Worship again for the way in which he had received the institution, and assured him that it gave them great hope to know that they might take home the knowledge they had gained that day, and be able to distribute it among their fellow members through the medium of papers and speeches.

The MAYOR, responding, assured them that the little he had done in extending to them a welcome he did with great cordiality and pleasure to himself. He felt it his duty to extend any hospitality he could to such representatives of municipal institutions as were present, and he should have been very sorry indeed if on a visit to Salford any such important body of public servants had not received a civic welcome. He was glad they had seen the new turbo-generator which he had had the privilege of starting last week, and which the Electrical Committee claimed would save a lot of money for Salford, besides supplying electricity at about cost price. He wished every success to the institution.

Mr. H. BOOT (past-president) proposed success to the Salford Corporation undertakings, committees and officials, including Alderman Hulton (chairman Cleansing Committee), and Councillor Billington (chairman Electricity Committee). To realise the value of the undertakings they had seen that day they needed to go back many years before the great wave of municipalisation came about, when our streets were in darkness, when our children were

[illegible] ward in the interests of the ratepayers—energies which were rarely appreciated—and gave their services for nothing. With regard to their day's visits, their thanks were due to their chairman for the kind way in which he had allowed them to inspect what [illegible] to trespass on their time by going into figures, but it was sufficient to know that the machinery they [illegible] become much larger in the future. His friend Mr. Billington, the chairman of the Electricity Committee, had always taken the greatest interest in that undertaking. He could remember the time [illegible] state of efficiency, but Salford then had not realised that if they wanted the best men in the engineering line they must pay for them. They had, however, [illegible] get a municipal man who would work for the municipality with the same devotion as he would for himself, they must pay him well, and that if they had not a really good man it was very difficult to get rid of him. (Laughter.) Some years ago the reputation of the Salford electricity undertaking was notorious in the engineering world, and its recovery from that position of disgrace to one of high efficiency now was largely to the credit of Councillor Billington. He had been chairman of the committee for five or six years, and had had a very uphill [illegible] companies, who would have liked to have swallowed up Salford's undertaking, and probably would have done so but for the strenuous opposition of Councillor Billington. They had recently started a very large turbine, and they had only to consider it and compare its capital outlay with that of its predecessors to realise what great economies were being effected in the manufacture of electricity. The cost of electricity in future must come down by leaps and bounds—an opinion in which he was sure their new engineer, Mr. Robertson, would uphold him. He congratulated the borough on having secured the services of his old friend Mr. Robertson, and he advised the borough to stick to him. He had made a great name for himself in Greenock, where he was most highly respected, and if ever they were foolish enough to let him leave Salford he would leave an even greater reputation behind him. They were also indebted to Mr. Hamblett and Mr. Platt for the admirable buildings and mechanical plant they had shown in their department. Their perfect equipment showed that, in the appointment of such able men as their officials, the mayor, aldermen and council of Salford showed great wisdom, and knew how to use the great power which, as citizens of the Empire, was vested in them.

Acknowledging the toast, Councillor George Billington observed that when they looked at the wonderful strides which were being made in engineering, it was not surprising that machinery soon got out of date. Happily, they were now getting away from their bad reputation. He was sure those interested in electricity would learn something from seeing their new unit, the 5,000-kw. turbine. They would have learned that it was possible to generate as much current, and have the same consumption throughout the whole of Salford from the one unit as from all their other generators combined, and this, moreover, at a price of £14 per kilowatt compared with £28. That would have a tendency to reduce the prices of current. He believed if they generated current at the lowest possible prices it would induce the owners of large works to come into the town, and so bring more labour and the circulation of more money. He could assure Mr. Boot that Salford knew they had in Mr. Robertson one of the best engineers of the country, and he was going to bring Salford out on top in matters of electricity. It was now about the fifth from the top throughout the country, whereas it was once the fifty-fifth. He could assure them that his committee greatly appreciated such visits as theirs very highly, especially when the visitors were engineers who understood the subject.

Alderman Hulton, replying on behalf of the Cleansing Committee, referred to the [illegible] time when the mayor, Mr. Hamblett and himself first entered the council, Salford's death-rate had gone down from 28 in the 1,000 to 15, and he thought the cleansing department had had some part in reducing the death-rate. He was glad to hear that they had learned something in their inspection of the slab-making plant, which he believed was one of the best in the country. They had visited many towns and seen other plants and improved on them, and in this connection he would like to say how gratifying it was that corporation officials and corporations throughout the country were always ready to impart their knowledge to others, so that the whole community should benefit from their experience. Their council had recently agreed to submit their slabs to certain tests, and he was glad to say that they had come through them with far better results than they had anticipated. It might interest them to know that Salford was the first town in the country to put into operation the Free Libraries Act, and was one of the first to light the streets by gas, besides being the actual first to intercept sewage.

Mr. A. R. Bleazard (Clitheroe), chairman of the North-Western District, proposed the health of Mr. McKenn, the district secretary, who, in the course of a suitable acknowledgment, said he had worked the more keenly to make that evening a success, because, though he now belonged to Heywood, he was on his native heath. He was born and educated within a stone's-throw of that building. He urged upon members the necessity of attending more closely to their duties as members of that institution, and said it was only by doing so that they could achieve the greatest benefits for themselves and those whom they served.

Mr. Hamblett, acknowledging the remarks on his department, said if the time ever came when he should have to leave his present office, nothing would give him greater pleasure than again to enter the council and give his services free to the community. Proceeding to describe the slab-making works, he said they had secured in the plant which they had seen a very profitable asset. Though they saw a large amount of unused clinker on the tip, they did not feel alarmed or fear that they would not soon get rid of it, and as many slabs as they could possibly convert it into. Some towns with slab plants had made the mistake of using clinker too quickly after it left the destructor furnaces, and another mistake they made was in not taking out the iron. Their slab-plant buildings had cost £4,000, and the plant itself something like £3,000. When they applied for powers to manufacture and sell slabs and mortar, the Government inspector told them they could not get powers to sell, but happily they were able to tell him that two days previously they had obtained Parliamentary powers to do so. They could therefore sell either to other municipalities or private firms. Their installation was the best and most economically worked in the country, and they hoped eventually to sell to such profit that they would be able to pay over something towards the relief of the rates. They were able to sell them to their own corporation committees at 2s. 8d., and to outsiders the charge would be a little more. If they honoured him with inquiries, he would be glad to quote prices. He advised them never to use a slab until it was twelve months old, and if they could get it three years old all the better. In the tests that had been made at the Manchester School of Technology their twelve-months'-old 2-ft. slab was found to have a central breaking load of 5,970 lb., while used as a beam it bore a load of 4,300 lb. Mr. Platt, their building surveyor, who was a member of that institution, regarded this as a very satisfactory test. A slab made from pure clinker, without cement facing, bore a breaking load of 4,920 lb., and 3,140 lb. used as a beam. These latter could be sold cheaper than 2s. 8d. In manufacture they had tried, as far as possible, to do away with the human element, and in a little time, when the business got thoroughly going, he was confident they would be able to show good results that would be satisfactory to their council. They were now making per day an average of 350 2-ft. slabs, 300 2-ft. 6-in., and 270 3-ft., and those results were got without harassing the men, who worked in a quiet, steady manner without any sweating. Referring to the imitation granite walls which had been seen at the works, Mr. Hamblett said they hoped shortly to instal a plant with which they would improve on that artificial stone, and be able to produce from the destructor clinker, and very little else,

The Surveyor

And Municipal and County Engineer.

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a pure, strong, white stone, with which they would be able to build bright, clean houses, and bring about brighter and cleaner towns.

Mr. J. A. Robertson acknowledged the remarks made about the electricity department which he controls. He did not agree with the view that a few years ago that town deserved its notorious reputation in regard to electricity. He believed the verdict was [illegible] exaggerated. Anyhow they were now taking steps which would bring them into line with the best in the country, and that would enable them to supply electricity at a price so low that all manufacturers would want it. He had had some conversation as to the objects of their institution, and he had come to the conclusion that it could only be beneficial to the various branches of municipal activity in which they were engaged as engineers. They would hear more of the use of electricity in all industries in future, and he was glad that the municipal engineers of different departments were among the first to recognise and adopt its uses.

During the evening vocal contributions were given by the Heywood Orpheus (Male Voice) Glee Party, while two of its members, Messrs. T. Fogg and C. K. Holden, contributed a number of songs and duets.

Water-softening Plant.—The gratifying increase of activity in many of the manufacturing industries during the past three months is well exemplified by the large number of orders now being placed in this country for water softeners and purifiers, feed-water heaters, &c.—a sure index of works extensions on a large scale. We are informed that since the outbreak of war Messrs. United Water Softeners, Limited, the well-known makers of "Lassen-Hjort" and "Permutit" water softening and purifying plants, have entered into contracts to erect over 100 installations, totalling several millions of gallons daily, for firms in the United Kingdom. Prominent among those who have placed orders for softening plants are the Admiralty (30,000 gallons per day), Vickers, Limited (14,000), Armstrong, Whitworth & Co., Brunner, Mond & Co. (500,000), the *Daily Chronicle* Paper Mills (240,000), Bickershaw Collieries (Ackers, Whitley & Co., 360,000), the North-Eastern Railway (96,000), British Portland Cement Manufacturers (12,000), Merryweather & Co. (8,000), Curtis & Harvey (19,000), Sir Joseph Lyons & Co. (24,000), and the Erith Oil Works (192,000). The considerable extent to which such labour-saving and waste-eliminating appliances are adopted in this country is in itself a refutation of the oft-repeated assertion that British manufacturers are backward in utilising scientific methods of economy in their works processes.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

When will the Local Government Board take a more enlightened view as to the life of reinforced concrete? Has not the time arrived when it might be suggested to those in authority that it would be well to appoint a Departmental Committee to investigate the question thoroughly, to hear witnesses, to inspect various works, to obtain information by correspondence, and generally to investigate the matter on practical and scientific lines? Would not a report from such a committee be of extreme value to engineers and others?

* * * *

Is not the district council of Kidderminster to be heartily congratulated on the manner in which they deal with those of their employees who enlist? Would it not be well if all local authorities were to follow the example of Kidderminster, and encourage enlisting by their servants in every possible manner?

* * * *

In view of the evident unfairness of charging for water supply on the basis of the rateable value of the premises so supplied, why should not all water be supplied in the same manner as gas or electricity—viz., by measure? Is it not rather a bogey to assume that if water were supplied by meter an insufficient quantity for sanitary purposes would be used? Would not such a method of supply largely curtail the enormous waste of water that is going on by day and night throughout the country? Is it not difficult to break down habit and custom?

* * * *

Is it not evident, in following Dr. Boobbyer's annual report of the health of Nottingham, that enteric fever clings to the dwelling houses where "pails" and not water-closets are installed? Does it not seem ridiculous that, although the council of Nottingham give a subsidy of £2 10s. for every pail-closet converted into a water-closet, there should still be more than 34,000 houses in Nottingham provided with these obsolete obscenities? When will the Local Government Board be sufficiently stiff-backed to pronounce the so-called dry system of "interception" as absolutely insanitary, and set their official face dead against it?

* * * *

Is it any cause for surprise to see by the daily papers that the roads in Northern France have entirely given way under the stress of battles, and that they are to be reconstructed temporarily with sleepers—in fact, made into American corduroy roads? In addition to the thousands of picks and wheelbarrows that it is said are to be sent from England at once, would it not also be well to send about half-a-dozen civilian road experts as well to advise as to what should be done?

* * * *

Is it a fact that the Baltic timber trade is mainly controlled by Germans—not merely at the moment by reason of the blockade they have declared, but in ordinary times? Of course, this will be true so far as shipments from Dantzic and Memel go, but it is stated on good authority that the ubiquitous German has controlling capital interests both in the principal Russian and Swedish timber companies and in timber shipping. If this is so, will the effect not be detrimental to the future use of wood blocks for paving purposes, having regard to the fact that these are mainly cut from timber emanating from Baltic ports? Is it not to be hoped that it may prove possible, by means of the new powerful Canadian ice-breakers which are now at work trying to maintain an open passage through the ice to the White Sea, for timber shipments to continue to come in sufficient quantities from Archangel? But is it a fact that, as a rule, trees grown in such far northern latitudes do not mature to sufficient size to be suitable for cutting wood blocks?

* * * *

As "it is an ill wind that blows nobody good," may not one result be that we shall encourage Colonial timber growers to meet our requirements? Should not Canada be able to furnish suitable timber for wood paving blocks at a reasonable price? May it not also mean a revival of favour for Australian wood? Anyway, is it not certainly desirable that our money should go into the pockets of our Colonial cousins rather than to support aliens—enemies or otherwise?

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

445. Cement Testing. State, and describe the apparatus necessary for conducting the tensile weight test specified by the Portland Cement [illegible]

446. Materials. What [illegible] Mexican [illegible] is a natural product [illegible] Trinidad Lake Bitumen or is it merely a trade name for a by-product of petroleum? If the latter, what part of Mexico does it come from? (H. F. W., *London.*)

447. Geodesy. Explain how the length of a measured base may be corrected by triangulation. What is meant by a "base of verification"?

448. Hydraulics. Explain and illustrate by reference to a stream of rectangular section, 12 ft. wide and 3 ft. deep, the term "hydraulic mean depth." Give short or other methods and approximately to what extent the mean velocity of the stream would be affected by widening it to 24 ft., assuming the depth and gradient to remain the same. (A.M.I.C.E.)

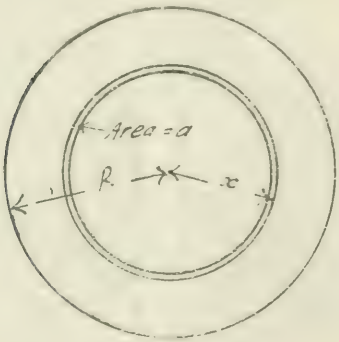
449. Roof Truss.—Sketch a light iron roof truss of a span of 20 ft., and give enlarged details of the joints.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

444. Strength of Shaft.—Find the relation between the stress on a twisted shaft and the moment producing it. Find the least diameter of a solid steel shaft to transmit 269-horse power at 150 revolutions per minute, the stress being limited to 9,000 lb. per square inch.

Take the case of a solid circular steel shaft subjected to a twisting moment or torque T lb.-in. To determine its moment of resistance, first consider the force on an elementary ring infinitely small in thickness, of radius x in. and area a sq. in.



Let f_1 = shear stress on element.
f = shear stress on the extreme fibres, lb./in.^{2}
l = radius of shaft, inches.

Now the strain varies directly as the distance from the axis of revolution—*i.e.*, the centre of the shaft; also provided the limit of elasticity is not exceeded, the stress varies directly as the strain; hence—

$$\frac{f}{R} = \frac{f_1}{x} \therefore f_1 = \frac{f}{R} \cdot x$$

The total force on the element $= f_1 a = \frac{f}{R} \cdot x a$

The moment of this force about the centre of the shaft $= \frac{f}{R} x^2 a$, and consequently the moment of the internal forces over the whole cross-section.

$$\sum_0^R \frac{f}{R} x^2 a = \frac{f}{R} \sum_0^R x^2 a. \text{ But } \sum_0^R x^2 a = I_1 \text{ the moment}$$

of inertia or second moment about the axis.

The twisting moment = the moment of resistance $= T = I_1 \frac{f}{R}$. Now for a solid circular shaft it can easily be proved that $I_1 = \frac{\pi R^4}{2}$ and $T = \frac{\pi R^3}{2} \cdot f$ the formula required.

The horse power H = the torque (lb.-ft.) × angular velocity (radians per minute) ÷ 33,000.

The torque $= \frac{T}{12} = \frac{\pi R^3}{24} f$ lb.-ft.

and the angular velocity $= 2 \pi n$ radians/min.

$$\therefore H = \frac{\pi R^3 f}{24} \cdot \frac{2 \pi n}{33,000} = \frac{\pi^2 R^3 f n}{396,000}$$

$$R = \sqrt[3]{\frac{396,000 H}{\pi^2 f n}}$$

By inserting the numerical values given in the question we get

$$R = \sqrt[3]{\frac{396,000 \times 269}{10 \times 9000 \times 150}} = 2 \text{ inches}$$

$\therefore$ diameter of shaft = 4 inches.

(H. F. W., *Tottenham.*)

Let Fig. 1 represent two pieces of shafting provided with disc coupling as shown, one disc being

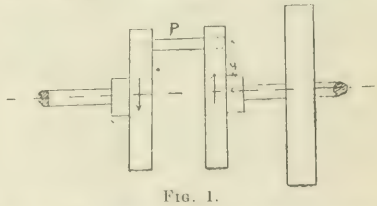


Fig. 1.

driven from the other through the pin P, which is obviously in shear. Let the shearing resistance of pin = S.

Then from the figure $Wl = Sy$.

If area of pin $= a$, and shearing stress on pin $= f$, we have $W l = f a y$.

Referring to Fig. 2, in which there are two such pins, the case is

$$Wl = Sy + S_1 y_1 = f a y + f_1 a_1 y_1$$

The dotted circles in Fig. 3 are to represent the position of the pinholes in the other disc.

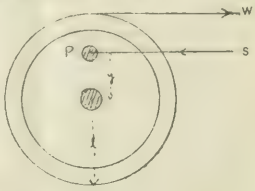


Fig. 2.

Before the force W was applied, the pinholes coincided, and were exactly opposite each other; but after the application of W the shear of the pins

caused a small movement of the one disc with respect to the other.

It is evident that the strain varies directly as the

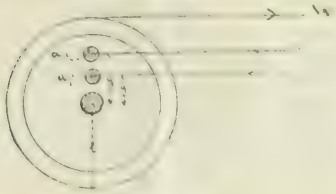


FIG. 3.

distance from the centre of the shaft.

When the material is elastic, by Hooke's law (1) the stress varies directly as the strain.

$$\frac{S_1}{S_2} = \frac{f_1}{f_2} = \frac{r_1}{r_2}$$

Substituting, we have

$$W = \frac{f_1 \times \frac{\pi}{4}(d_1^2 - d_2^2)}{y}$$

$$= \frac{\pi}{4y}(d_1^2 - d_2^2)f_1$$

Let $\frac{\pi}{4y} = \frac{1}{Z}$

Even if the pins be equal in area, so that $d_1 = d_2$,

$$W = f_1 d_1 + f_2 \frac{d_2^2}{d_1} = f_1 d_1 (1 + f_2)$$

It is interesting to note from this result that the additional pin has only increased the strength by one-quarter.

Take next a like arrangement of pins, but in this case let the number be great—such a number as to make a solid or hollow section.

Let the area of each pin or element be a_1, a_2, a_3, &c., distant r_1, r_2, r_3, &c., respectively, from the axis of revolution.

As above, we have

$$W = \frac{f_1}{y}(a_1 r_1^2 + a_2 r_2^2 + \text{&c.})$$

But the quantity in brackets is the polar moment of inertia of the section.

Let it equal I_p.

Then we have

$$W = \frac{f_1 I_p}{y} = f_1 Z_p$$

f_1 is the maximum or skin stress on the material, and y is the distance of the skin of the shaft from the axis of revolution.

$$\text{Also } \frac{I_p}{y} = \text{polar modulus of section} = Z_p$$

The above result can be stated as follows:—

Twisting moment = skin stress × polar modulus of the section.

The formula for a solid shaft is—

$$63025 \frac{\text{H.P.}}{N} = \frac{\pi}{16} f D^3$$

where H.P. = horse power to be transmitted.

N = number of revolutions per minute of shaft.

f = maximum stress allowable in shaft in lb. per sq. in.

D = diameter of shaft in inches.

In this case we have (by substitution)

$$\frac{63025 \times 269}{150} = \frac{3{\cdot}142 \times 9000 \times D^3}{16}$$

$$\therefore D^3 = \frac{16 \times 269 \times 63025}{150 \times 3{\cdot}142 \times 9000}$$

$$\therefore D = \sqrt[3]{\frac{16 \times 269 \times 63025}{150 \times 3{\cdot}142 \times 9000}}$$

$$= \sqrt[3]{61}$$

$$\therefore D = 4 \text{ inches}$$

$\therefore$ required diameter of shaft = 4 inches.

(B. K. *Haines*.)

The Proposed Trent Navigation Improvement. Although the requisite parliamentary steps had been taken, the Nottingham Corporation have declined to proceed further with the proposal to spend £150,000 in improving the navigation of the Trent.

SALARIES IN DEVON.

"OVERPAID" ON £120 A YEAR.

At Tuesday's meeting of Bideford Rural District Council, Mr. W. Harris presided in the absence of the Chairman. A report of the Finance Committee recommended that the salary of the surveyor, Mr. J. Turner, be increased from £100 to £120 per annum, to date from the last half-quarter commencing from 31st inst.

The chairman, who moved the adoption of the report, said they could not see away from the fact that they were not overpaying their surveyor.

Mr. Slee said it was not twelve months ago that the surveyor's work was reduced by all the main roads in the district being taken over by the county council, and their surveyor was even better paid then he was before when he had to look after the roads for only £20 more.

Mr. J. T. Jewell said the salary was ample for what the surveyor did.

Mr. J. Vanstone thought the surveyor could get about more among the men and not write them letters to say when he was coming.

The recommendation was defeated by ten votes to five, and the chairman informed the surveyor of the result.

Mr. Turner: I have nothing to thank the council for, then, have I?

DEATH OF MR. DAVID BALFOUR.

Mr. David Balfour, M.INST.C.E., F.G.S., senior partner of the firm of Messrs. D. Balfour & Son, Newcastle-on-Tyne, died on Tuesday, we deeply regret to learn.

Mr. Balfour carried out a very large number of engineering works in many parts of England and Scotland, including bridges, sewerage and sewage disposal works, water supplies, tramways, railways, shipping slatches, and shipbuilding yards. For a number of years, however, the work of the firm has been carried on by his son, Mr. David Balfour, junr., M.INST.C.E.

Mr. Balfour gave evidence before many Royal Commissions, and contributed a number of papers to different scientific societies in both England and Scotland.

Midland Municipal Schemes.—The Smethwick Corporation have decided to promote a Bill in Parliament for authority to execute a score or more of street widenings to accommodate tramway and motor traffic; for enlarged powers with respect to streets and buildings, gas, abattoirs, tramway waiting-rooms, and the public library rate. The Wolverhampton Corporation seek further powers with respect to the construction of waterworks in Staffordshire and Shropshire. The Stafford Corporation ask for the confirmation of a Provisional Order to authorise the extension of the borough boundaries and for further powers in regard to the gasworks. Bills are also being promoted by the Shropshire County Council and the West Gloucester water undertaking.

A Footpath Action. In the Chancery Division on Monday, Mr. Justice Sargant delivered his reserved judgment in the action brought by the Attorney-General, at the instance of the Knottingley Urban District Council and by the council, against Mr. Fred Roe, coal merchant, Knottingley, for a declaration that it was the duty of the defendant, as proprietor of a worked-out limestone quarry adjoining a public footpath known as England lane, to erect and maintain a wall or other obstruction to prevent the path subsiding into the quarry to the danger of the public. It was explained that a considerable portion of the original wall had collapsed, with the result that a section of the footpath had fallen into the quarry, constituting a grave nuisance and danger to the public. The action was not defended, but, his lordship feeling some doubt as to his power to grant the relief claimed, the case was argued at length by Mr. Romer, K.C., for the plaintiffs, and judgment was reserved. Mr. Justice Sargant now said he was satisfied on the authorities that the plaintiffs were entitled to the relief sought, and made a mandatory order on Mr. Roe to abate the nuisance by removing the footpath and erecting a retaining wall or similar obstruction to safeguard passengers using the path. The defendant was ordered to pay the costs of the action.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers [illegible] to send him information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bridgwater T.C. (December 16th. Mr. W. M. [illegible] the officials in attendance, and it was stated by the [illegible] district concerned, to get the sanction of the board [illegible] the proposed [illegible]

Darlington T.C. (December 16th. Major J. [illegible] the Bank Top Mart. The scheme was opposed by the [illegible]

East Riding C.C. (December 15th. Mr. A. S. [illegible] £1,100 to purchase Raywell House for the purpose of opening on the site a sanatorium for the treatment of tuberculosis.—It was stated on behalf of the council that Raywell House was the most suitable site for the purpose available. It stood 225 ft. above the sea level. There was an ample water supply on the premises, but to avoid any possible danger of pollution it was proposed to obtain a supply from the Hull Corporation. The provision of an adequate [illegible] drainage would be a serious expense, and in consideration of that the vendor had agreed to reduce the purchase price from £6,000, the original figure, to £5,400.

Lowestoft T.C. (December 16th. Mr. A. W. [illegible] £1,000 for the construction of a new road from the Waveney-drive to the ice works, and £500 for works of piling at the Waveney-drive Embankment.—The borough surveyor, Mr. G. W. Hamby, submitted the plans of the proposed scheme.

Manchester T.C. (December 17th. Mr. W. O. E. Meade-King).—£14,110 for works of private street improvements.—Mr. Heath, deputy town clerk, appeared for the corporation, and evidence in support of the application was given by Alderman Jones and Alderman Turnbull, the chairman and the deputy chairman of the Paving and Highways Committee, and Mr. Meek, deputy city surveyor. There was no opposition.

Yarmouth T.C. (December 8th. Mr. R. H. Bicknell).—£800 for the purchase of land at Caister-on-Sea for the extension of the cemetery.—The borough surveyor, Mr. J. W. Cockrill, stated that the nearest well to the existing cemetery was 160 yds., and another 200 yds. from the new portion. The distance from the nearest inhabited part of the borough was 3 miles. The medical officer of health, Dr. A. N. Stephens, said he considered the site a suitable one for a burial ground.

York T.C. (December 21st. Mr. W. H. Collin). —£6,214 for the purchase of 48 acres at Hewarth, for the purpose of providing working-class dwellings.—The city engineer, Mr F. W. Spurr, stated that the land, which belonged to the Ecclesiastical Commissioners, was the best obtainable. There was other land, but the price was prohibitive.

APPLICATIONS FOR LOANS.

Barrow-in-Furness T.C. £1,500 for works in connection with a public park.

Beckenham U.D.C.—£710 for making up Arrol-road.

Goole U.D.C.—£6,000 for a sewerage scheme, and £1,000 for [illegible] houses.

Lichfield T.C.—£4,100 for twenty working-class dwellings.

Meriden R.D.C. [illegible] the Fillongley sewage disposal scheme.

Newton R.D.C.—£3,100 for a water supply for [illegible].

Nuneaton T.C.—£600 for a steam cart for stone [illegible].

Paignton U.D.C.—£235 for concreting footpaths.

Rathdrum R.D.C.—£700 for sewerage works.

Southampton T.C.—£300 for laying out a burial ground, and £[illegible] for sewerage works.

Stoke-on-Trent T.C.—£12,230 for the purposes of the sanitary undertaking, and £[illegible] for the purchase of a site for a refuse destructor.

Westhoughton U.D.C. — £1,400 for a refuse pulveriser.

LOANS SANCTIONED.

Cardiff T.C.—£28,000 for new mains and services.

Carlisle T.C.—£885 for a new street.

Clitheroe T.C.—£1,200 for road improvement.

Croydon T.C.—£60,131 for paving works.

Ealing T.C.—£2,000 for the extension of the destructor at the southern sewage works.

Eccles T.C.—£3,000 for electricity mains, and £450 for a coal conveyor and [illegible].

Esher and Dittons U.D.C.—£1,250 for making up two roads at Claygate.

Hayward's Heath U.D.C. £500 for laying out a cemetery.

Holywell U.D.C.—£14,000 for a water and drainage scheme.

Hungerford R.D.C—£1,500 for the erection of working-class dwellings.

Hunsworth U.D.C.—£4,700 for a sewerage scheme.

Mansfield T.C.—£4,000 for gas stoves.

Middlesex C.C.—£1,460 for a tuberculosis hospital and dispensary at Hounslow.

Portland U.D.C. — £5,162 for the erection of municipal offices.

Yarmouth T.C.—£4,140 for public baths, and £4,500 for the construction of a promenade and lawn.

FORTHCOMING INQUIRIES.

DECEMBER.	£
29.—**Cowes.** For works of water supply (Mr. P. M. Crosthwaite)	1,000
29.—**Llandudno.** For laying out a golf course (Mr. Edgar Dudley) ...	1,225
29.—**Truro.** For works of sewage disposal (Mr. A. G. Drury)	24,300
29.—**Tunbridge Wells.** For works of sewerage (Mr. M. K. North)	4,155
30.—**Barnoldswick.** For private street works (Mr. Edgar Dudley) ...	6,594
30.—**Enfield.** For the erection of a lodge and public conveniences (Mr. M. K. North)	–
30.—**Wootton Bassett.** For the provision of a water supply (Mr. P. M. Crosthwaite)	
31.—**Amersham.** For the erection of workmen's dwellings (Mr. H. S. Stewart) ...	2,900
31.—**Ledbury.** For the erection of workmen's dwellings (Mr. W. H. Collin) ...	3,000
31.—**Rotherham.** For works of sewerage and water supply (Mr. A. W. Brightmore)	1,527
31. **St. Helens.** For laying out playing fields (Mr. Edgar Dudley)	2,200
JANUARY.	
1.—**Dartford.** For the purposes of road widening and working-class dwellings (Mr. H. S. Stewart)	10,630
1.—**Rotherham.** For a sanitary conversion scheme (Mr. A. W. Brightmore) ...	353
1.—**Southend.** For the purposes of a recreation ground, the erection of an electricity station, and the provision of conveniences (Mr. M. K. North) ...	4,645
1.—**Warrington.** For works of street improvement (Mr. Edgar Dudley) ...	7,540

The Sportsmen's Corps.—Attention is drawn to the advertisement in another column of an appeal on behalf of the Sportsmen's Corps, for which a second battalion is being raised. The first battalion is in training under excellent conditions at Gray Towers Park, near Hornchurch, Romford, and Mr. Walter Maughan, hon. examiner to the Institution of Municipal Engineers, is desirous of emphasising the advantages of the corps to municipal surveyors and their assistants, in the hope of eventually forming a Surveyors' Company. The corps consists almost exclusively of sportsmen and professional men.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

[illegible]

BUILDINGS.

Banbridge (Co. Down) U.D.C.—The council have [illegible]

Devon C.C.—It is proposed to purchase Egglesford House, Egglesford, for the purpose of an asylum for mentally defective patients.

East Ashford R.D.C.—The sanitary surveyor, Mr. T. H. Wilde, submitted recently the plans and specifications for a second [illegible] at Mersham, mentioning that the well excavations had reached 6 ft., and [illegible] The specifications and plans were approved, and the council decided to advertise for tenders directly the county medical officer had signified his approval.

Flintshire C.C.—It was stated at a council meeting [illegible] with the Wirral Peninsula. The cost will probably be about £22,000.

Lockerbie T.C.—A scheme has received approval for the erection of public slaughter-houses at an estimated cost of £1,200.

Ramsgate T.C.—It is proposed to expend £1,300 in providing the necessary lifts for bathing huts.

Rhyl U.D.C.—Mr. Carey, of London, has reported upon the plans prepared by the surveyor, Mr. A. A. Goodall, for the partial reconstruction and strengthening of the promenade pier. On the plans as a whole he considered the scheme satisfactory, but suggested certain alterations in detail. The surveyor was empowered to consult with him in London, with a view to arriving at an agreement for the adoption of his suggestions, and this, it was now reported, he had done, the additional cost of the alterations recommended by the engineer being £750. The plans as approved by Mr. Carey were approved by the council, and the surveyor was requested to proceed with the preparation of the final scheme as now confirmed.

Scarborough T.C.—The council have approved the plans of the borough engineer, Mr. H. W. Smith, for the erection of two blocks of bungalows (twenty in number) and a shelter in the South Cliff Gardens, at an estimated cost of £1,260.

Skipton U.D.C.—It has been decided to build a generating station at an estimated cost of £13,000, to include plant.

Southend T.C.—The Highways and Works Committee have been authorised to provide a women's convenience at Bell Wharf, Leigh, at an approximate cost of £105.

Truro T.C.—In connection with the recent fire at the [illegible] buildings the insurance was estimated at about £1,500, and it is stated that £1,300 has been claimed by the [illegible] It is proposed to make improvements in the course of restoration of the destroyed buildings.

Worcestershire C.C.—In order to provide employment it has been agreed to proceed with the erection of new schools in Watt-close and Stourbridge-road, Bromsgrove, new police station, [illegible] at Droitwich; and new offices at the Shire Hall, Worcester.

Wigton R.D.C.—The surveyor, Mr. T. B. Simmons, has been asked to prepare a plan for a 15-ft. bridge at Caldbeck. It was explained that the county surveyor, Mr. William Finch, had expressed an opinion in favour of a 25-ft. bridge. In the discussion which followed it was generally thought that 25 ft. was too wide for the bridge, and Mr. [illegible] said the proposal was ridiculous. The chairman, Mr. W. Williamson, said that [illegible] towards the cost of the bridge it would have to be [illegible]

HOUSING AND TOWN PLANNING.

Blofield R.D.C.—Plans are being prepared for the erection of cottages at Acle.

Dorking R.D.C.—A scheme is being prepared for the provision of workmen's cottages in the parish of Ewhurst.

Warmley R.D.C.—The surveyor, Mr. H. M. Bennett, has received instructions to prepare plans for eight working-class dwellings.

Woking U.D.C.—The council are taking up a loan of £5,500 for a housing scheme.

PARKS AND OPEN SPACES.

Frinton U.D.C.—The surveyor, Mr. E. M. Bate, is preparing a scheme for the improvement of the field in which the Rock Pool is at Beaches Point.

ROADS AND MATERIALS.

Bath T.C.—The city surveyor, Mr. C. R. Fortune, reports that when the work now in hand in Boatstall-lane, and the street works, executed by their own staff, between Bridge-street and the south-east corner of the Empire Hotel, were completed, there would be a small excess of expenditure over the £2,400. The work of levelling the old concrete laying on the floor space between the stone pillars supporting the roadway, and works necessary to be done to drain and repair Boatstall-lane to prevent damage to surface water, would [illegible] additional cost, but this could be done by workmen of the corporation. Several members of the Surveying Committee declared that the road was a credit to Mr. Fortune and his [illegible].

Crowle U.D.C.—At the request of the county council the urban council have prepared and forwarded an estimate of the cost of widening 3 miles 32 chains of the main road from the new Keadby Bridge to Doncaster to a width of 20 ft.

Edinburgh T.C.—It is intended to take advantage of the erection of the new electric light station at Portobello to cut off the corner at King's-road and the High-street, and make the turn at that point more rounded. It is also proposed to widen High-street and the whole of King's-road right down to the beach.

Hornsey T.C.—The Middlesex County Council have agreed to contribute towards the proposed resurfacing of Muswell Hill-road, Endymion-road, Upper Tollington-park, and Hampstead-lane, district roads in Hornsey. They will pay one-third (£3,122) of the annual instalments of principal and interest on the loan, and the Road Board will contribute a similar sum. In respect to the proposed improvement of Hornsey-lane, Crouch End-hill, and Tottenham-lane, subsidised roads in Hornsey, the county council have agreed to pay annual loan charges not exceeding £2,924, which will represent two-thirds of the cost to the Hornsey Town Council.

Neath R.D.C.—A proposal has been made for the construction of a new road to give work for the unemployed, and the Road Board are to be asked to make a grant in aid of the cost.

Norfolk C.C.—The county surveyor, Mr. T. H. B. Hyslop, reported recently to the Eastern Highways Committee that in various parts of the county they had been obliged to use increased quantities of materials, owing to the heavy traffic entailed by military operations. He had been asked by the Officer Commanding the Royal Engineers in the district to supervise the making up of the roads in the various military camps. His hands were already fairly full in attending to the construction of the new military road across the county, and in other works, but if it was the committee's desire he would undertake this additional duty. The chairman said he had no doubt that the committee wished the [illegible]

Tiverton T.C.—It has been agreed by the Western Highways Committee to carry out the proposed improvement to the Hunstanton and Wells main road at Bradninch, a ratepayer having given the necessary strips of land for widening.

Rowley Regis U.D.C.—The Road Board state that they are prepared to make a grant of £270 being half the estimated cost of improving the main road at Oldbury-road, Black Heath, as a means of providing work for the unemployed during the war, and that the balance of the expenditure should be borne by the county council and district council in equal proportions.

Southend T.C.—The council have agreed to apply to the Local Government Board for sanction to a loan of £135 for the purpose of slab-paving the footpath of London-road, between Trinity Church and Ashburnham-road; also for sanction to a loan of £103 for the purpose of slab-paving the footpath on the east side of Saxon-road, between Bescombe-road and Southchurch-road, and between Guildford-road and the houses north of Coleman-street. A resolution has also been passed to make up Sandleigh-road, Westcliff, under the Private Street Works Act; and it was reported that a portion of Riviera-drive, Southchurch, had been placed on the list of streets to be made up.

Swansea T.C.—It is understood that sufficient property has now been obtained for rounding off the Castle-Temple streets corner, and that the cost to be incurred will be (including the £6,000 originally expended) not more than £12,000. It is stated that difficulties of an insurmountable character were encountered in regard to a proposal that at the same time Temple-street should be widened.

Truro R.D.C.—The surveyor, Mr. S. Gilbert, has prepared an estimate for a new road commencing at a junction with the Perth-ker-Tolverne road, near Trevean Cottage, and terminating at Coombe.

Tyrone C.C.—Upon the recommendation of the surveyor for the Southern Division, it has been resolved to acquire a quarry in the Clogher rural district at Tullyvar, at a cost of £1,620.

Wolverhampton T.C.—The council have accepted the following tenders of Mr. Arthur Holloway in connection with the construction of new streets: £1,161 for Ashwood-street and Gower-street, £1,168 for [illegible] and £491 for Argyle-road.

Worcestershire C.C.—In connection with the provision of work owing to the war, several road improvement schemes have been adopted, including putting in slag foundations and remaking roads at Kidderminster, Oldbury, Stourbridge, and Stourport.

SEWERAGE AND SEWAGE DISPOSAL.

Bulkington U.D.C.—Some months ago an inspector of the Local Government Board visited the district to inquire into sanitary and other matters, and as the outcome of his report the local authority were called upon to proceed with a sewerage scheme. Mr. F. C. Cook, engineer and surveyor to Nuneaton Town Council, was called in to advise the Bulkington Council, and, acting in conjunction with the local surveyor, a scheme was prepared. Owing to the natural formation of the district, various difficulties and obstacles had to be overcome, and this made a considerable difference to the expense. A scheme with an outfall to the west of the London and North-Western Railway was placed before the Local Government Board, and they have given their sanction to the proposal and to the raising of a loan of £8,500.

Dewsbury T.C.—A letter has been received from the West Riding Rivers Board stating that unless plans and scheme for the extension and improvement of the Thornhill sewage works are submitted to the Local Government Board by January 31st next legal proceedings will be considered.

Hunsworth U.D.C.—The council have accepted the tenders of Messrs. R. Slinger & Sons, at £3,804, and the Sandix Engineering Company, at £375, in connection with the sewerage scheme.

Longridge (Lancs) U.D.C.—The tender of Ames-Crosta Sanitary Engineering Company, Limited, Nottingham, has been accepted for the supply of a patent "Simplex" rotary sprinkler.

Nuneaton T.C.—The tender of Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, has again been accepted for a further installation of their patent "Simplex" rectangular sprinklers.

Ossett T.C.—Under the local Act of Parliament it has been resolved by the council to make a charge for the admission of trade effluents into the sewers of 1½d. per 1,000 gallons for crude sewage, 1d. for partly treated sewage, and ½d. where the millowner complied with all the requirements as to the provision of tanks and filters.

Southend T.C.—Authority has been given the Highways and Works Committee to accept the lowest satisfactory tenders for the making up or sewering of Southsea-avenue and Vernon-road, Leigh; St. George's Park-avenue, Westminster-drive, and a back passage at Westcliff; and Gloucester-terrace, Thorpe Bay.

WATER, GAS, AND ELECTRICITY.

Bedwellty (Mon.) U.D.C.—The surveyor, Mr. D. H. Price, has submitted terms from the Rhymney and Aber Gas and Water Company for supplying Blackwood with water over Twynffald, and including the construction of a surface reservoir on the high ground between Pwllglas and the top of Gordon-road or Plas-road. The estimated cost of the works is £3,500. The consideration of the matter has been deferred.

Hampton U.D.C.—The council have passed a resolution stating that, as at present advised, they are unable to support the proposed electricity scheme of the London County Council, and suggesting the better course would be to postpone the matter until after the war, in order that it may be more fully and fairly discussed in all its bearings.

Rhyl U.D.C.—With respect to the water supply to St. Asaph from Rhyl sources, of which complaint has been made by the St. Asaph Rural District Council, it has been agreed by the Rhyl Council to lay a new main to Abergele, the rural council to pay for a new 4-in. main from that town to their district, and Rhyl agreeing to reduce the charge for water to 1s. from 1s. 3d. per 1,000 gallons. This will do away with the proposed pumping plant.

Settle R.D.C.—A scheme has been approved for the extension of the water supply at an estimated cost of £3,400.

Selby R.D.C.—A letter was read last week from the Local Government Board with reference to the decision of the council to hold in abeyance the proposed water supplies to the villages in the council's area, owing to the present high prices for materials. The Local Government Board said they could not regard the reasons given as sufficient to justify the council in postponing the provision of the supplies. It was agreed that the clerk should state, in reply, that the rural council would reconsider the question, and that the surveyor, Mr. R. F. Braithwaite, had received instructions to commence the preparation of estimates and particulars.

Walton-on-Thames U.D.C.—The surveyor, Mr. R. Wilds, reported recently that the Metropolitan Water Board were seeking powers to purchase certain fields and land on the nearer side of the Apps-court pumping station, for the purpose of filter-beds.

West Penwith R.D.C.—Negotiations are proceeding for the provision of a water supply for Carbis Bay.

Wolverhampton T.C.—It has been agreed to make electricity main extensions at a total estimated cost of £1,277.

MISCELLANEOUS.

Southend T.C.—It has been decided to make up the paths at the sanatorium, erect a new coal store, cart shed, and bathroom, and pave the yard, at a total cost of £313.

Wolverhampton T.C.—It was decided last week to accept a tender for the supply of four 25-horse power chassis. It was explained that the town's motor 'buses had been taken off the streets owing to the chassis having been secured by the War Office.

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

PERSONAL.

Mr. F. Lloyd, assistant surveyor to the Brownhills Urban District Council, has resigned.

Mr. E. E. Moore has been appointed assistant surveyor to the Maesteg Urban District Council.

Mr. W. L. Carr, surveyor to the Ruislip-Northwood Urban District Council, has had his salary increased by £50 per annum.

Mr. Leonard Skidmore, surveyor to the Uttoxeter (Staffs) Urban District Council, has resigned after twenty-eight years' service.

Mr. James Vezvedder, borough surveyor and inspector, South Queensferry, has been appointed borough surveyor and inspector of Keith.

Mr. Leslie Rosevear, borough engineer of South Shields, was at a special meeting of the Institution of Civil Engineers, on the 15th inst., transferred from the class of associate member to that of full member.

Institution of Water Engineers.—The concluding instalment of our report of the recent winter meeting of this body will appear in next week's issue.

Sheffield Municipal Schemes.—The Sheffield City Council have decided to promote in Parliament the Derwent Valley Water Bill and the Sheffield Tramways Bill.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Coventry Town Planning Scheme.—A conference has taken place between the committee of the Warwickshire County Council and representatives of Foleshill District Council with reference to the Coventry town planning scheme. So far the Foleshill authorities have asked the county council to assist them to secure that in any order made by the Local Government Board the local body shall have the power of passing or otherwise dealing with, plans relating to their area.

West Riding Rivers Board.—At a meeting of this board on Friday last it was decided to notify the Keighley Corporation that the board cannot consent to any postponement of the scheme of sewage pumping, and that the board hoped to hear within a month or so that the work had been commenced. It was also decided to bring pressure to bear upon a number of other authorities, including Golcar Urban District Council, Barnsley Rural District Council, Doncaster Corporation, Halifax Corporation, Rothwell Urban District Council, and Wombwell Urban District Council, in respect to the carrying out of their works.

Farmers' Objection to Tar-spraying.—Dulverton Rural District Council recently received a letter from the Somerset county surveyor, Mr. E. Stead, asking the council to make application for the usual grant towards tar-spraying the main roads for 1915-16. Farmer members of the council refused to vote for tar-spraying, contending that it was absolutely dangerous for horses, who could not keep their feet on tar-surfaced gradients. That was the experience of practically every farmer in Devon and Somerset. The clerk, Mr. R. Barrow, was backed up by the highway surveyor, Mr. E. Groves, formerly of Liskeard in his contention that tar-surfaced roads were a boon to all living near the highway, and cost less to maintain.—The farmer members were in the majority, and application for the grant will not be made.

FOR OTHER ADVERTISEMENTS

See End of Paper.

THE SANDGATE URBAN DISTRICT COUNCIL

invite applications for the offices of Surveyor, Inspector of Nuisances, Inspector under the Petroleum Acts, and Inspector of Omnibuses and Hackney Carriages.

The duties are to be taken up on 1st February, 1915.

The total salary will be £109 per annum (for an Inspector of Nuisances being £50). The appointment as Inspector of Nuisances will be subject to the approval of the Local Government Board.

Offices and clerical assistance are provided. The officer will be required to give his whole time to his duties, and not be allowed private practice. He must reside in the district, give approved security, and enter into an agreement in the form required by the Council.

The duties include those of Surveyor or Engineer in all matters in which the Council may require the services of a surveyor or engineer, including preparation of plans, specifications and estimates, and the carrying out of works; the keeping of accounts relating to the officer's department, and works under his charge, including the main road accounts; the supervision of the foreshore and charge of the main roads, and the Council's waterworks and the sea defences.

Applications (marked "Surveyor" on the envelope), stating age, qualifications, experience, and present employment, and accompanied by copies (which will not be returned) of not more than three recent testimonials, must reach me not later than 9 a.m. on 12th January, 1915, the day fixed for making the appointment.

No forms of application or further information will be furnished. Canvassing will disqualify.

Dated 22nd December, 1914.

J. SHERA ATKINSON,
Clerk to the Council.

Council Offices,
Sandgate, Kent. (2,192)

THE SANDGATE URBAN DISTRICT COUNCIL

invite applications for the offices of Collector, Clerical Assistant in the Office of their Surveyor, and Assistant Overseer for the Parish of Sandgate.

The total salary will be £90 per annum. The Officer will be required to give his whole time to his duties, unless the Council consent to his undertaking other duties.

He must reside in the district, give approved security, and enter into an agreement in the form required by the Council.

The duties will include the collection of general district rates and any other rates levied by the council, and the keeping of the Council's stores accounts, wages books, and main road accounts.

Applications (marked "Collector" on the envelope), stating age, qualifications, experience, and present employment, and accompanied by copies (which will not be returned) of not more than three recent testimonials, must reach me not later than 9 a.m. on 12th January, 1915.

No forms of application or further information will be furnished. Canvassing will disqualify.

Dated 22nd December, 1914.

J. SHERA ATKINSON,
Clerk to the Council.

Council Offices,
Sandgate, Kent. (2,193)

NEWMARKET RURAL DISTRICT COUNCIL.

SOHAM WATER SUPPLY.

TO WELL BORERS AND CONTRACTORS.

The above Council invite Tenders for the Sinking of Well and Borehole, also test pumping to obtain a supply of water for the Parish of Soham.

Specifications of the works proposed may be obtained from the Engineers, Messrs. Sands & Walker, Milton Chambers, Nottingham, on payment of Two Guineas, which will be returned on receipt of *bonâ-fide* Tender (not afterwards withdrawn) and the return to the Engineers of all documents lent to the Contractor.

The accepted Contractor will be required to provide a guarantee bond for £200 from an office approved by the Council.

The lowest or any Tender not necessarily accepted.

Sealed Tenders, endorsed "Boring," to be sent to the undersigned on or before the 11th day of January, 1915.

By order,
F. J. BLACKBOURN,
Acting Clerk to the Council.

Dean Chambers,
Newmarket.
December 21, 1914. (2,191)

A Recent Development of the Sewage Problem.

DISCUSSION AT WORKS MANAGERS' ANNUAL MEETING.

At the meeting of the Association of Managers of Sewage Disposal Works, at which Mr. Edward Ardern, M.Sc., presented a paper on the subject of [illegible]

The Chairman (Dr. [illegible]) [illegible] the author in the matter of introducing air or oxygen to sewage. After all the sewage problem consisted of two things: either bring air to the sewage or the sewage to the air; the latter was done by way of filters, the former by the way described that evening.

Mr. S. Lowcock, as one who years ago had done a good deal of work in connection with the oxidisation of sewage, agreed that it did not make any difference, as far as principle went, whether they treated the sewage in the presence of what was really activated sludge on the grains of the filter, or blew air through the sewage, which was not at all a new idea. Dr. Angus Smith used mechanical air purification of sewage thirty-two years ago, and showed the formation of nitrates were so facilitated, just as the author and Dr. Fowler now contended. He keenly appreciated the system, which obviously would be an exceedingly useful thing where there was not room for filters. He had not the slightest doubt it could be done satisfactorily; but to his mind the whole question was one of cost. If they adopted quiescent treatment, and took 20 per cent of the tank capacity for activated sludge, then they would have largely to increase their tank accommodation, and in many cases there would be large engineering difficulties in filling and emptying the tanks within a reasonable time. The author had said nothing as to the cubic feet of air which had to be supplied at some definite pressure. With this information they might be able to form some idea of the cost.

The Chairman reminded the meeting that the American experiments in this direction had produced negative results at first. Oxidisation by means of warm air was a rather recent idea, but they all knew that nitrification took place more readily in summer than in winter. This had also been noted in India. The American experiments were all based on the idea that there should be some medium which should be a contact material between the air forced in and the sewage itself, and a good many of the earlier experiments on introducing air directly so as to bring about oxidisation failed to realise that important point. The first method was only that of blowing air through, but as water would only hold a certain amount of oxygen, there had to be a continual series of treatment.

Dr. G. J. Fowler said the reason he felt sure that this was going to be a success was that the process described was not in the nature of a lucky shot. It was really the coping stone of years of investigation—the culminating result of a large number of experiments in various places. He described in some detail his own work at Manchester, where he was obsessed with the idea of oxidising everything. It never occurred to him to separate the clear liquid from the sediment; in fact, he threw away the baby with the bath. In America he was much impressed with what had been done in the St. Lawrence laboratories, where they had more or less oxidised sewage in a twenty-four hours' blow, and when he returned he spoke to the president of the Sewage Commission suggesting it was rather a good thing to try something on those lines; but the president of the commission said that it was just the old percolating filter over again. They thought of chemicals, but with 1,000 million gallons a day to deal with the cost was prohibitive. The only practicable idea then was sludge steamers; but they set to work to try to develop a process which should be independent of surface in the ordinary sense. The result rather came to this, that for practical purposes all that aëration could do was to render the sewage a little more stable; still the idea was to work with aëration alone, and sufficient attention had not been paid to the sludge matter present. Having described the progress of his experiments with Captain Mumford, he remarked that what was important in them was that they demonstrated the possibility of absolute clarification without any filter at all, and the deposit which they got from settled domestic sewage contained at least 10 per cent of nitrates. The reason he thought the new process was going to be a success was because it was a process which dealt with the whole sludge and not a part of it. He reminded Mr. Lowcock that in any filter there was a certain imperfection of action, but in Mr. Ardern's work the whole sewage was completely purified. They were all aware that there were points of engineering details which would have to be settled, but they were rapidly being settled; but all they wanted to do at present was to emphasise the fact that the principle was proved. It would be premature to go into engineering details. He insisted that for the first time there was really a possibility of tackling the nitrogen question.

Mr. S. E. Melling, county analyst (Cheshire), gave a short account of the work at Salford following on the Manchester experiment, and explained the roughing filters designed by the late borough engineer, Mr. Corbett, whose function was to remove the suspended matter left in the tank effluent before passing on to the percolating filter. The sewage question was acute in Salford, and faced with expense; they desired to keep down cost as much as possible. The only rational method seemed to him along the lines of the Manchester experiment. With a twelve-hour blow they got results similar to those in Table 4, and the question was cutting down the time of aëration. In the end they cut down the time to two hours, and got from 85 to 87 per cent of purification with a highly clarified effluent.

Mr. W. H. Duckworth (Salford) said with a three hours' blow they got results which were some justification for what they were doing. He further explained the tables, and said that a feature of the work was that the plant they had used had been intended for something entirely different. They made no claim at all that it was the best plant, for it was only a beginning. He had no doubt that somebody in the near future would design something infinitely better, and perhaps infinitely cheaper. He explained the method of blowing the air, and opined that it was pregnant with possibilities. There was no secret about the matter, and he invited, on behalf of his committee, anyone to go and see what was being done. He particularly called attention to the clear definition of the line of demarcation between the liquid and the sludge.

Mr. W. J. Lockett desired publicly to express his appreciation of the work of Mr. Melling and Mr. Duckworth, and said he considered the results achieved at Salford were very valuable.

Mr. A. P. I. Cottrell (Westminster and Bristol) said he felt the greatest respect for those who were carrying on these experiments, which he hoped would continue. As an engineer, he was always ready to have his preconceived notions upset. He agreed that the system described was really a new application of an old principle which produced the changes described. He wondered, however, if it could be applied on any large scale at a reasonable cost. No figures had been given them. Tank accommodation would doubtless have to be 20 per cent greater. One point interested him greatly—viz., they were told that the resultant sludge was very much more valuable than sludge obtained in ordinary works. Sir Wm. Crookes had pointed out that we were pouring £15,000,000 a year into the sea, and if they could save some of that waste by this system it was of the utmost importance.

Mr. E. Mather (Salford) expressed his appreciation of the attention which the association was giving to the subject. In view of the large sums vainly spent on sewage works in the past, sanitary authorities were rather shy of new methods which cost much money. He suggested the advisability of an expert committee being appointed to go into the question as a whole.

Mr. J. H. Abbott (Chiswick) asked how many weeks of blowing it took to get the sewage into the initial stage of activity.

The Chairman, referring to Mr. Mather's remarks, said the time was hardly ripe for a committee. The

Royal Commission was still sitting, and no one knew how much longer they would sit. As to more actual details, these would take [illegible] to compute and there would be [illegible] of dealing the problem.

Mr. Andrews, replying to the thanks tendered the meeting generally for the attention [illegible] to the paper. It was essential that the [illegible] should be in addition [illegible] with the sewage dealt with. He was [illegible] in a position to take the question of cost, which was the question of course. The idea of increased tank accommodation was the reverse of what obtained. With [illegible] they could get in tank storage per day and so on [illegible] the tank [illegible] this system would tend to reduce it. When they got superior results the cost was relatively much smaller. In their experiment they had [illegible] more than [illegible] of tree [illegible] per square foot of tank area per hour. There was something definite that would enable them to [illegible] some approximate calculation as to the cost. On that basis the cost should not exceed the cost of present chemical treatment. As to [illegible] tanks with greater pressure [illegible] of dealing with a [illegible] volume [illegible] that remained to be worked out; but in considering maintenance they must not lose sight of the tremendous reduction in capital outlay. There would be a very wide margin. They had no specific data as to the value of the sludge beyond the raising of its characteristics. It was absolutely granular, and the water left it rapidly. It could be handled easily by simple straining filters. Mr. Abbott had touched a weak spot, the initial production of the activated sludge. It depended on the strength and character of the sewage; the original experiments took five weeks, and three weeks with pure domestic sewage. On this point more information was required, without doubt.

SOCIETY OF ENGINEERS.

ANNUAL GENERAL MEETING.

The 54th annual general meeting of the Society of Engineers (incorporated) was held at the offices of the society, 17 Victoria-street, Westminster, on Monday, December 14th.

The awards of premiums made in respect of papers published in the Journal of the Society during 1914 were announced as follows:

The President's Gold Medal to Mr. A. S. E. Ackermann for his paper on "The Utilisation of Solar Energy."

The Bessemer Premium, value £5 5s., to Mr. A. S. Buckle for his paper on "Cylinder Bridge Foundations in the East."

The Clarke Premium, value £5 5s., to Mr. S. M. [illegible] for his paper on "Mechanical Appliances for the Painless Killing of Animals."

The premium, value £3 3s., for members of affiliated societies, to Mr. R. H. Cunningham (Crystal Palace Engineering School) for his paper on "Irrigation in India."

A society's premium, value £2 2s., to Mr. James [illegible] for his paper on "Uses of the Hydraulic Mining Cartridge."

The report of the council, which was adopted, referred to the amendments that are being made in the articles and by-laws, and stated that the financial position of the society was satisfactory. A list of members of the society serving with the Allied Forces was included in the report. The scrutineers of the postal ballot reported that the following had been elected as members of the council and officers for 1915: President, Norman Scorgie; vice-presidents, Percy Griffith and Henry C. Adams; members of council, Henry Adams, C. T. Walrond, S. Cowper-Coles, B. H. M. Hewett, F. H. Hummel, G. A. Becks, F. L. Ball, W. B. Esson, G. O. Case, and W. N. Twelvetrees; associate-member of council, C. E. May; hon. secretary and hon. treasurer, D. B. Butler.

Messrs. Begbie, Robinson & Cox, chartered accountants, were reappointed as auditors for the year 1915. Votes of thanks to the council and officers for 1914, and to the scrutineers of the ballot lists for the election of the new council, were passed unanimously.

Golder's Green Crematorium.—During the twelve months ended October 31st last, 651 cremations were carried out at Golder's Green, as against 598 in the preceding twelve months.

DIARIES AND CALENDARS.

Messrs. [illegible] of Nottingham have issued [illegible] diary for 1915. One [illegible] at an opening [illegible] bound in black leather, and it is of a size that permits it to be carried in a coat pocket. The other is the firm's popular scribbling diary, [illegible] with blotting paper, it supplies a [illegible] worth. The price of the first-mentioned diary is not [illegible]

The London and Lancashire Life Insurance Company, Limited, Liverpool, have issued a wall calendar [illegible] variety of useful information, space for daily memoranda [illegible]

The diary of Messrs. Hay and Bright, Ltd., [illegible] 187-201 Union-street, Borough, London, S.E., [illegible] and income production. It competes in [illegible] the other papers, [illegible] with descriptive of the firm's numerous specialities, among which may be mentioned their well-known pavement, floor and roof lights, prismatic glazings and reflectors, fireproof staircases, ventilators, casements, lead glazing and steel skylights and domes. Full particulars as to prices are given.

A vividly drawn fire picture is an appropriate feature of Messrs. Merryweather & Sons' wall calendar for 1915. On the back of the calendar the firm call attention to the numerous advantages and prompt [illegible] they have issued, and which are obtainable on application to them at their works, in Greenwich, S.E.

Prestwick Sewerage Extension. The work of extending the main outfall sewer at Prestwick, Ayrshire, to include a new drainage district, has just been completed at a cost of over £5,000.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

NOMINATIONS FOR COUNCIL, 1915-16.

The attention of members and associate-members of the Institution of Municipal and County Engineers is directed to By-law 11, and particularly to the following portions thereof:—

". . . each member or associate-member of the institution shall be at liberty to nominate one member or associate-member for the council. . . . Members' or associate-members' nominations must be received by the secretary not later than 1st February in each year, and must be accompanied by the written consent of the nominee. . . ."

It should also be noted that, under the provisions of By-law 10, no nomination paper or ballot list will be sent to any member or associate-member whose subscription for the year commenced May 1, 1914, remains unpaid.

(By order of the council)
J. W. Dudley Robinson,
Secretary.

92 Victoria-street, S.W.
December 21, 1914.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

PARKS SUPERINTENDENT. December 26th.—Corporation of Manchester. £500 per annum.—Mr. T. Hudson, town clerk.

SURVEYOR'S ASSISTANT.—December 27th.—Wath-upon-Dearne Urban District Council. £85 per annum.—Messrs. Nicholson & Co., clerks.

CLERK OF WORKS.—December 28th.—Gower Rural District Council. £3 per week.—Mr. H. J. Ind, clerk, Central Buildings, Fisher-street, Swansea.

BOROUGH SURVEYOR.—December 29th.—Corporation of Sandwich. £150 a year.—Mr. E. C. Byrne, town clerk.

CITY ENGINEER AND SURVEYOR.—January [illegible] Public Spring Corporation, £725, [illegible] Mr. J. [illegible] Hall, Port-of-Spain, [illegible] dad, B.W.I.

ASSISTANT ENGINEERS.—April [illegible] Railways and State Railways Department, [illegible] Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department, [illegible] Works, [illegible] S.W.

BOROUGH ENGINEER AND SURVEYOR AND [illegible] ENGINEER.—January 7th, [illegible] £750 [illegible] town clerk.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 3.30 p.m. on Thursdays will be inserted in the following day's issue. [illegible] Page 1 of this issue, page 3 of the Supplement [illegible] Wednesday [illegible] *to arrange that they shall reach* The Surveyor *office by noon* [illegible] *summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1076) subject to later confirmation by letter.*

[illegible] town clerk.

LIVERPOOL.—February [illegible] £50, and £25.—Mr. E. R. Pickmere, town clerk.

WALTHAMSTOW.—Plans for the erection of [illegible] at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation.—Mr. Reginald Blomfield, R.A., has been [illegible] Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 3.30 p.m. on Thursdays will be inserted in the following day's issue. [illegible] *to arrange that they shall reach* The Surveyor *office by noon* [illegible] *summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1076) subject to later confirmation by letter.*

Buildings.

WEST SUFFOLK.—December 28th.—For the [illegible] county council.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

NANTWICH.—December 29th.—For the erection of eight workmen's houses, for the rural district council. —Mr. C. E. Davenport, architect, 152 Hospital-street, Nantwich.

EAST STOW.—December 30th.—For the erection of working-class dwellings, for the rural district council. —Mr. H. E. Wilkes, clerk, Council Offices.

BEBINGTON.—December 30th.—For the erection of a school, for the Sub-committee for Education.—Messrs. E. Kirby & Son, architects, 5 Cook-street, Liverpool.

UPTON-UPON-SEVERN.—December 31st.—For the construction of water supply works, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

DOCKING.—December 31st.—For the erection of six houses, for the rural district council.—Mr. J. A. Stoughton, clerk, Fakenham, Norfolk.

UXBRIDGE.—December 31st.—For repairs to hospital buildings and the erection of a laundry, for the Joint Hospital Board.—Mr. W. L. Eves, surveyor, 54 High-street, Uxbridge.

SURREY.—December 31st.—For the provision and erection of permanent buildings of light construction for school clinics and tuberculosis dispensaries, for the county council.—The Surveyor, County Education Offices, Penrhyn-road, Kingston-upon-Thames.

BATTERSEA.—January 1st.—For the erection of [illegible] for the borough council.—Mr. W. Marcus Wilkins, town clerk.

PORTHCAWL.—January 4th.—For the construction of about 5½ miles of cast-iron mains, and other minor works, for the urban district council. The Surveyor.

ALICANTE.—January 5th.—For the construction of the first section of the provisions market, for the municipality.—Commercial Intelligence Department of the Board of Trade, 73 Basinghall-street, London, E.C.

CHEPPING WYCOMBE.—January 5th.—For the construction of a ferro-concrete bridge on the Hennebique system, and laying a short length of sewer and surface-water drain, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

BINGHAM.—January 6th.—For the erection of six workmen's houses, for the rural district council. Mr. C. W. Kendrick, sanitary surveyor, Bingham.

FAVERSHAM.—January 7th.—For laying cast-iron pumping main, supply mains, with all necessary fittings, and the construction of a new service reservoir, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster, S.W.

WANDSWORTH.—January 9th.—For an addition to a public library, for the borough council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

BRISTOL.—January 11th.—For the erection of a ferro-concrete tobacco warehouse, for the Docks Committee.—Mr. W. W. Squire, engineer, Cumberland-road, Bristol.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner.—Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

Iron and Steel.

BURY.—December 28th.—For the supply of cast-iron castings, for the Joint Water Board. Waterworks Manager, Parsons-lane, Bury.

SEVERN.—December 31st.—For providing, laying, and jointing about 4½ miles of cast-iron water mains, with valves, hydrants, air valves, and the construction of engine-house and reservoir, for the rural district council.—Messrs. Willcox & Raikes, Union-chambers, 63 Temple-row, Birmingham.

DUNDEE.—December 31st.—For the supply of structural steelwork, for the corporation.—Mr. H. Richardson, manager and engineer, electricity works, Dudhope, Crescent-road.

BIRMINGHAM.—January 6th.—For the erection of the constructional steelwork comprised in boiler-house, engine-house, switch-house, and offices at Nechell's generating station, for the Electric Supply Committee.—Messrs. Harrison & Cox, Council Chambers, 109 Colmore-row, Birmingham.

CONWAY.—January 7th.—For the provision and laying of cast-iron 6-in. and 4-in. water mains, with valves, hydrants, air valves, and chambers, for the rural district council.—Mr. T. L. Oliver, engineer, Stanley Buildings, Conway.

Roads.

STOWMARKET.—December 28th.—For the supply of 69 tons of tar, for the urban district council.—Mr. G. W. Lingwood, surveyor, Butter Market, Stowmarket.

BILLERICAY.—December 28th.—For making up roadways and pathways, for the rural district council.—Mr. H. R. Bird, architect, St. Thomas's-gate, Brentwood.

ELGIN.—December 29th.—For the supply of road materials, for the county council.—Mr. E. D. Jameson, county clerk, Elgin.

HARWICH.—December 30th.—For the supply of 1,000 tons broken granite, as required from time to time, for the corporation.—Mr. F. Harold French, borough surveyor, 41 Church-street, Harwich.

HARWICH.—December 30th.—For steam rolling as required during the year, for the corporation.—Mr. F. Harold French, borough surveyor.

FLINTSHIRE.—December 31st.—For the supply of road materials, tar and cartage, for the county council.—County Surveyor, Mold.

BOGNOR.—December 31st.—For the supply of flat, straight granite kerbing, ditto circular, and composition paving slabs, for the urban district council.—Mr. J. Jubb, clerk.

SOMERSET.—December 31st.—For surface-tarring main roads, for the county council.—Mr. Edward Stead, county surveyor, Wells.

DERBYSHIRE.—December 31st.—For the supply of granite, basalt, slag, limestone, tarred macadam, tarred chippings, and other suitable materials, for the county council.—Mr. J. W. Horton, county surveyor, County Offices, St. Mary's-gate, Derby.

PORTHCAWL.—January 1st.—For making up private streets, for the urban district council.—Mr. A. J. Oborn, surveyor.

CANNOCK.—January 1st.—For the supply of refined tar prepared in accordance with the specification of the Road Board, for the urban district council.—Mr. R. Blanchard, engineer and surveyor.

BROMLEY (Kent).—January 4th.—For works to be executed in the part widening of Mottingham-lane, for the rural district council.—Mr. R. Craig, highway surveyor, Farnborough, Kent.

NORMANTON.—January 4th.—For work of widening and improving, for the urban district council.—The Surveyor.

HUDDERSFIELD.—January 4th.—For the supply of a motor-driven street sweeping machine, with collecting van attached, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

BEXLEY.—January 5th.—For the supply of highway materials and stoneware socketed pipes.—Mr. W. T. Howse, surveyor.

EASTHAMPSTEAD.—January 5th.—For the supply of granite, slag, limestones, and flints, for the rural district council.—Mr. J. R. Treadwell, surveyor, Council Offices, Bracknell.

MIDDLETON.—January 6th.—For the supply of about 1,000 tons of 4 to 6 granite setts, for the corporation.—Mr. William Welburn, borough surveyor.

GLOUCESTERSHIRE.—January 9th.—For the supply of stone for main roads, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

SOMERSET.—January 9th.—For the supply of about 70,000 gallons of refined tar, prepared in accordance with the specification of the Road Board, for the county council.—Mr. Edward Stead, county surveyor, Wells.

LINTHWAITE.—January 11th.—For work of paving with granite setts on concrete, kerbing, flagging, asphalting, and other incidental work, for the urban district council.—Mr. Albert Mallinson, surveyor.

TRING.—January 11th.—For the supply of 12,000 gallons of refined coal tar complying with the Road Board's specification, for the urban district council.—Mr. S. S. Gettings, surveyor.

WOODSTOCK.—January 11th.—For the supply of best hand-picked unbroken stone, best broken stone (2-in. gauge), best double-screened nuts, and binding chippings, for the rural district council.—Mr. A. G. Higgs, clerk.

WORCESTERSHIRE.—January 15th.—For the supply of blast-furnace slag, delivered to railway stations and canal wharves, for the county council.—Mr. C. F. Gettings, county surveyor, Worcester.

UCKFIELD.—January 13th—22nd.—For the supply of road materials, for the rural district council.—Mr. E. W. Ray Johnson, surveyor, Buxted, Sussex.

EAST GRINSTEAD.—January 20th.—For the sale of a steam roller, No. 2,711, by Aveling & Porter.—Mr. Charles Turton, surveyor, 6 High-street, East Grinstead.

CLUTTON.—For the supply of about 10,000 gallons of coal tar complying with Road Board specification, No. 5, specification for tar, No. 2, for the rural district council.—Mr. J. Sumner Dury, clerk.

GLOUCESTERSHIRE.—For surface tarring about 80 miles of main roads at various places, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

Sanitary.

DONCASTER.—December 29th.—For scavenging privies and ashpits, and the removal of house refuse, for the rural district council.—Mr. H. Thirlwall, inspector, 7 St. George-gate, Doncaster.

WOKING.—December 30th.—For sewering certain districts, for the urban district council.—Mr. R. Mossop, clerk.

ASHFORD.—January 1st.—For works of drainage of the boys' playing field, for the managers of the West London District Schools.—Mr. J. L. Gosling, superintendent.

BULKINGTON.—January 2nd.—For the removal of nightsoil, for the urban district council.—Mr. H. W. Wilson, surveyor, Attleborough, Nuneaton.

MANCHESTER.—January 4th.—For the supply and erection of Venturi meters, cast-iron pipes, valves, and contingent works at Davyhulme sewage works, for the corporation.—Secretary, Rivers Department, Town Hall.

DOVER.—January 4th.—For the collection and disposal of house refuse, for the corporation.—Mr. W. C. Hawke, borough engineer.

GREAT HARWOOD.—January 9th.—For alterations and extensions at sewage disposal works, for the Joint Sewerage Board.—The Engineers, Martholme, Great Harwood, Lancs.

KILKENNY.—January 16th.—For the construction of main drainage, for the corporation.—Mr. J. F. Reade, engineer, 29 Baronstrand-street, Waterford.

DARLASTON.—January 21st.—For the construction of stoneware pipe sewers, manholes, cast-iron pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

CHAILEY.—January 29th.—For works of sewerage, for the rural district council.—Mr. H. Bertram Nichols, engineer, 11 Victoria-street, Westminster, S.W.

Stores.

HASTINGS.—December 28th.—For the supply of manhole covers, gullies, ash-collecting tubs, brooms and brushes, for the corporation.—Mr. P. H. Palmer, borough engineer.

SUNDERLAND.—December 29th.—For the supply of street lamps, fire hydrants, gullies, manhole covers, asphalting, kerbing, sanitary pipes, and disinfectants, for the rural district council.—The Surveyor.

WOMBWELL.—January 1st.—For the supply of wrought-iron steam tube and fittings, main cocks, pendants, brackets, brass fittings, brooms, and other sundries, for the urban district council.—Mr. P. D. Walmsley, engineer and manager, Gasworks, Wombwell.

WANDSWORTH.—January 1st.—For the supply of blue bricks, castings, cement, disinfectants, road materials, salt-glazed ware pipes, street lamp columns, vans, carts, woodpaving blocks, and house refuse collection, for the borough council.—Council House, Wandsworth, S.W.

SLOUGH.—January 2nd.—For the supply of gas mantles, Portland cement, distilled tar, screened shingle, and prepared tar-macadam, for the urban district council.—The Surveyor, 4 William-street, Slough.

PLYMOUTH.—January 16th.—For the supply of paints, varnishes, ironwork, petroleum oil, broomheads, household brushes, iron and steel, pitch-pine, deals, flooring, carbolic powder, Portland cement, tar, pitch, painters' brushes, explosives, creosote, disinfectant fluid, granite kerbs, setts, tools, india-rubber goods, hose, and shipchandler's goods, for the corporation.—Mr. James Patton, borough engineer and surveyor.

Miscellaneous.

NORFOLK.—January 9th.—For the supply of tools, implements, barrows, and handcarts, for the county council.—Mr. T. H. B. Heslop, county surveyor, Shirehouse, Norwich.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted

ABERYSTWYTH.—For the construction of a covered reservoir and the laying of 6-in., 5-in., 4-in., and 3-in. cast-iron water mains, together with valves, hydrants, and other castings, and the laying of 15-in. cast-iron sea outfall, for the rural district council.—Messrs. Dodd & Dodd, Birmingham:—

A. T. S. Hyslop, Lampeter	£9,117
J. A. Ewart, junr., Taunton, Somerset	4,625
G. P. Trentham, Limited, Birmingham	4,125
T. Wilkinson & Co., Poole, Dorset	3,998
G. Law, junr., Kidderminster	3,990
E. H. Page, Cardiff*	3,870

BANBURY.—For sewage disposal works, for the corporation.—Mr. William [illegible] engineer:—

[illegible]	£ [illegible]
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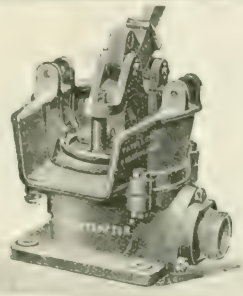

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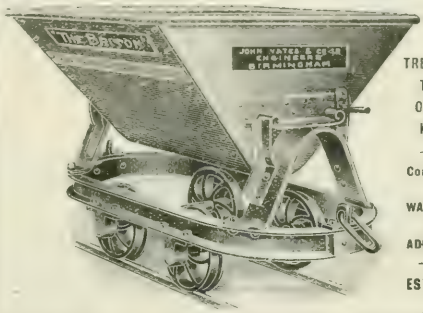

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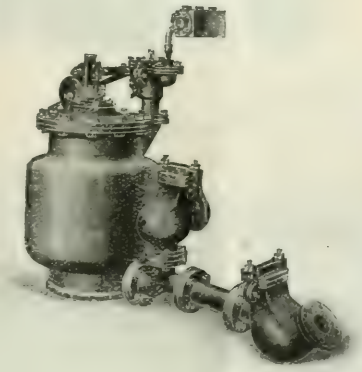

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APPOINTMENTS OPEN.

PORT-OF-SPAIN CITY COUNCIL.

The Council invite applications for the combined posts of City Engineer and Engineer of the Port-of-Spain Water and Sewerage Works.

2. The salary attached to the post of City Engineer is £[illegible] a year and to that of Engineer of Water and Sewerage Works £[illegible] a year, with travelling allowance at the rate of £75 a year.

3. The intention of the Council being that the two posts of "City Engineer" and "Engineer of Water and Sewerage Works" should be held by the same person, every application must be for the two posts combined.

4. The offices are pensionable under the Port-of-Spain Corporation Ordinance, 1914.

5. The appointment so far as concerns the post of Engineer of Water and Sewerage Works, is subject to the approval of the Governor.

6. Candidates must be corporate members of the Institution of Civil Engineers of England, and must possess experience in the design, construction, and maintenance of waterworks and sewerage systems.

7. Applications, accompanied by not less than three recent testimonials, and stating age and previous experience, must be supported by satisfactory evidence that the candidates possess the qualifications set forth in the preceding paragraph of this notice, and must be forwarded so as to reach the undersigned not later than the 31st January, 1915.

8. Candidates must also forward with their applications a medical certificate of fitness for service in the West Indies.

9. The successful candidate will be required to furnish a bond with an approved surety in the sum of £500 for the due performance of the duties of the above offices. He will be required to devote his whole time to the service of the Corporation, and to reside in the City of Port-of-Spain, or within one mile of the limits thereof; and he must be prepared to enter upon the duties of the appointment within one month from the date of the receipt by him of the official notice of his appointment.

JOSEPH ARNOLD LAMY,
Town Clerk.

Town Hall,
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